BO-AIR PL

Climate control for naturally ventilated poultry houses (24V and 230V versions)

User Manual

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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 two winch motors (left/right)
- Supports connection of either single-phase or three-phase motors (BP04-230V), or 24V DC motors (BP04-24V), all with built-in limit switches
- Motors must include a feedback signal (potentiometer, voltage-based, or current-based)
- Additional BO-AIR PL computers can be connected to control more curtain motors
- Extra analog outputs available for left/right 0–10V motor control signals (for 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 (BP04-230V) or 2 motor controls for 2 tunnel inlets (BP04-24V)
    - 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 configurable heating or cooling control.
    - If set to heating, it uses the same settings as the first heating control.
    - If set to cooling, it can operate as either on/off or modulating (via pulse-pause control)

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

Water consumption
Records water consumption (in liters) for the past 4 days, including today.

Feed consumption
Records feed consumption (in kilograms) for the past 4 days, including today.

General
- Logs the following measurements: house temperature, outside temperature, humidity, and CO_2
- Supports 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

Front and back temperature sensors

Two temperature sensors are available for measuring the house temperature: the front and back temperature sensors. These sensors are used separately only when both Heating 1 and Heating 2 are enabled. In all other cases where house temperature is required, the average of the two sensor readings is used.

If one of the sensors is defective, the temperature measurement will rely solely on the functioning sensor. However, an alarm will be triggered to indicate the malfunctioning sensor.

Heating 1 / Heating 2

The heating controls operate as on/off controls with hysteresis. Their starting temperature is set as an offset relative to the curtain setpoint temperature. This offset is entered as a positive value but will be subtracted from the setpoint.

Heating 1 is a dedicated heating control and can always be enabled. Heating 2 is combined with the cooling control, meaning it can function either as Cooling, Heating 2, or be disabled altogether.

When both Heating 1 and Heating 2 are enabled, Heating 1 uses the front temperature sensor, while Heating 2 uses the back temperature sensor. In all other cases, the average temperature from both sensors is used.

If the front and back temperature sensors are used separately, a defective sensor will cause the corresponding heating control to stop. When using the average temperature, both sensors must be defective to stop the heating control.

BP04 24V versus BP04 230V
There are two variants of the BP04 board:
- The 230V variant, which controls two motors for the left and right curtains.
- The 24V variant, which controls four motors for the left/right curtains and the tunnel inlet/outlet.

Since version V02.02.02, both boards are supported by the BO-AIR-PL software.

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-1 control

The heating control operates using an on/off mechanism with hysteresis. The activation temperature is defined as an offset below the curtain setpoint temperature. This offset is entered as a positive value but is subtracted from the setpoint.

⚠ If both curtain temperature sensors are faulty, the heating function will be deactivated.

4.3   Motor controls (curtains and tunnel air inlets)

The BO-AIR-PL manages two curtains—one on the left and one on the right. For tunnel air inlets, the control options vary depending on the BP04 variant used:

- *BP04-230V*
  This version provides motor control for the left and right curtains only.
- *BP04-24V*
  This version includes four motor controls: two for the left and right curtains, and two for the tunnel inlet and outlet.

Motor control and operation
The BO-AIR-PL operates the two curtains via dedicated motor controls—one for each side (left and right). Curtain operation serves as the primary control function. In configurations using the BP04-24V variant, the BO-AIR-PL additionally operates two tunnel valves, also with separate motor controls for the left and right sides.

All motors use the same control protocol and can operate either automatically or manually via an external multi-position switch. This switch also allows stopping the motor at any intermediate position.

When in manual mode—whether the motor is stopped or moving—the automatic system detects the manual override and refrains from interfering. This ensures that no alarms are triggered due to unreachable target positions.

Feedback Control
Motor control relies on position feedback, typically provided by a potentiometer. In feedback mode, a one-time calibration is required to define the minimum and maximum positions. No periodic recalibration is necessary.

During calibration, the system determines the minimum and maximum feedback values. A 10% margin of this range is used to validate the feedback signal.

Minimum feedback		1.0V
Maximum feedback		3.0V
The *Range* is:	3.0V – 1.0V = 2.0V	

10% of 2.0 V = 0.2 V. The valid range is therefore 0.8V to 3.2V.
If the feedback signal is outside this range, an alarm is triggered and motor movement is halted.

! If the calculated margin falls outside the acceptable range (e.g., below 0.0 V, above 3.3V, or below 0 OΩ), no validation check is performed.

Alarm Handling
Position errors and feedback alarms remain active until the underlying issue has been resolved and confirmed. Alarms do not clear automatically.

Control Behaviour
The motor does not continuously adjust its position. Once the target position is reached, it remains idle for 15 seconds before re-evaluating. Hysteresis is applied to prevent unnecessary corrections unless the deviation from the setpoint exceeds the defined threshold. New position values (for either the curtain or tunnel inlet) are transmitted instantly to the BP04, without soft ramping. Smooth motion is ensured by the curtain mechanism itself.

Manual Control
Curtain motors support software-based manual control, which sends a fixed position command directly to the motor. This function only works after successful calibration. Hardware-based manual control is always available via an external switch. This method overrides the internal motor logic, allowing the user to directly run, stop, or reverse the motor.

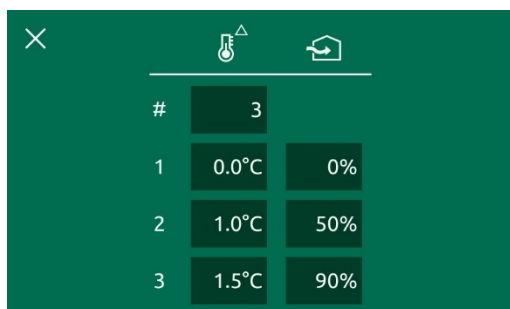A hand icon appears on the status screen whenever either form of manual control is active.

Wiring requirements for operation
During normal operation (or testing), ensure that the limit switches are correctly wired — or at least that terminal P is connected to both Open and Close — to allow the motor to function properly.
Also, make sure that the external manual switch is either installed and connected, or that a jumper is placed between terminals P and Auto. Without this, the magnetic switches used for curtain operation will not work. These wiring requirements apply to both base boards: BP04-230V and BP04-24V.

4.4 Tunnel ventilation control

Tunnel ventilation directs airflow from the front to the back of the poultry house, rather than from left to right. To enable this airflow pattern, the left and right side curtains must be nearly closed. Tunnel ventilation consists of up to three fan stages and a tunnel air inlet, with each stage corresponding to a specific inlet position. Each fan stage has its own offset temperature, relative to the main tunnel ventilation setpoint. Ensure that the fan stages are configured in order of increasing offset temperature — for example, stage 2 must have a higher offset than stage 1. You can configure between 1 and 3 active fan stages.

A configurable startup delay ensures that the fans only start once the curtains are in the correct position. A fixed hysteresis of 0.5 °C is applied between each stage, including before stage 1.

When tunnel ventilation is activated (i.e., when the temperature reaches the first stage's threshold), a tunneling switch timer begins. The system cannot exit tunnel mode until this timer expires. Similarly, when tunnel mode ends, the same timer prevents re-entry until it completes.

 Above the tunneling icon, the current ventilation stage is displayed (1, 2, or 3). A value of 0 indicates that tunnel mode is inactive. If the icon is grayed out, tunnel ventilation is not yet active because the tunnel air inlets are still moving. Once the inlets reach their target positions and the configurable delay has passed, the first fan starts and the icon becomes highlighted.

If the BP04-230V is used, the tunnel inlet position (%) is displayed alongside the ventilation stage. When the BP04-24V is used, this position is shown below the tunnel inlet status icon.

In addition to controlling two tunnel valves (left and right) via two motor outputs, the BoAir 24V also supports an analog output (0–10 V) that operates in parallel with the motor controls.

If the controller is configured as a secondary controller, it receives a signal (flag) from the primary controller indicating whether tunnel mode is active. This allows the secondary controller to adjust its curtains accordingly during tunnel ventilation, even though it does not manage the tunnel control directly.

4.5   Heating-2 or cooling control

The type of control can be selected: either Cooling or Heating 2.

Heating-2 control
Functions identically to Heating 1 and uses the same settings.

Cooling control
If tunnel ventilation fails to keep the temperature below the threshold level, cooling is required. Cooling can operate in two modes:

- *On/Off control*
This mode uses an adjustable hysteresis to control cooling activation and deactivation.

- *Modulating cooling control*
  This mode uses pulse-pause control with a fixed on-time. The off-time is variable and depends on the required cooling level, within adjustable minimum and maximum limits. At the lower end of the cooling range, the same hysteresis as used in On/Off control applies. During hysteresis, modulating cooling continues to run at the minimum level.

- Only standalone and primary controllers can operate the cooling control.
- If both temperature sensors for the curtains fail, cooling will be deactivated.

4.6 Wind and rain influences

Wind influence (based on wind speed and direction) can be enabled or disabled. When enabled, the wind direction determines which side of the building is considered wind-affected.
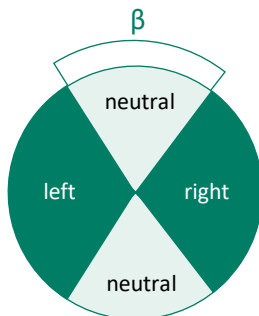
A neutral zone is defined in which the wind is considered to come from neither the left nor the right. The angle of this *neutral zone (β)* is configurable.

Neutral zone (β) = 40°
This creates a 40° sector at both the front and rear of the building. The remaining 140° is split evenly between the left and right wind zones: 180° – (2 × 20°) = 140°.

To determine the wind direction zone, a hysteresis of 12° is applied — 6° on either side. At startup, the wind direction is initialized at 0°, with a hysteresis band ranging from –6° to +6°. Once the actual wind direction moves outside this band (e.g., reaches or exceeds +6° or –6°), that new value becomes the updated wind direction reference, and the hysteresis band is re-centered around it. Although the wind direction is averaged over a 10-minute period, occasional short-term fluctuations can still occur. Without hysteresis, these could cause rapid and unnecessary switching between the neutral, left, and right wind zones. The hysteresis prevents such instability by requiring a meaningful directional change before a zone transition is triggered.
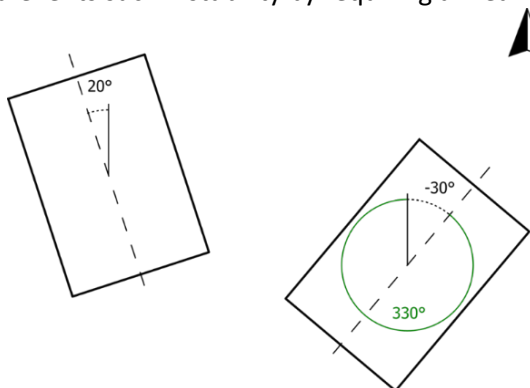
If only one house is in use, the weather station can be aligned with it, so that 0° corresponds to the front and 180° to the back. However, if two or more houses are in use and not aligned with each other, and they share a single anemometer aligned north–south, an offset is required. For example, if 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 axis 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 the wind is blowing toward, 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 — beginning at 0% at the start of the bandwidth and reaching maximum reduction at the end. Wind speed is measured using a moving average buffer of 40 samples, with each sample taken at 15-second intervals.

Table 1: Beaufort scale

Beaufort	m/s	Description	km/h
0	0.0 – 0.2	Calm	0 – 0.7
1	0.3 – 1.5	Light air	0.8 – 5
2	1.6 – 3.3	Light 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 – 56.0	Hurricane force	118 – 202

Rain detection can be enabled or disabled independently. When enabled, if the wind is neutral or blowing toward a curtain and the wind speed exceeds the minimum threshold (with a hysteresis of 1 m/s), that curtain closes to its lowest position. If the wind is neutral, both curtains close.

Rain detection works all the time. Once rain is detected, the rain status stays true for the next X minutes. You can set X between 0 and 30 minutes. Every time rain is detected, the timer resets. If no rain is detected for more than X minutes, the rain status turns 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 is neutral, both curtains close.

If the controller is a secondary controller, it uses either its own weather data or data from the primary controller to control the curtains. If wind and rain detection are off on the secondary controller (even if on the primary), no changes are made.

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

(i) Both wind speed and direction are measured using a moving average buffer of 40 measurements taken over 10 minutes (one every 15 seconds). This means changes in wind speed or direction take some time to show up in the control system.

4.7 Outside temperature compensation

In certain situations, it may be necessary to close the curtains more tightly due to cold outside conditions. This is done by increasing the curtain control bandwidth 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:
$(20.0 – 12.0 – 5.0) \times 0.5 + 5.0 = 6.5°C$

Outside temperature compensation applies only to the side where the wind is blowing, or to both sides if the wind direction is neutral. For the wind to affect a curtain, the wind speed must be at least the configured threshold for wind speed compensation start.

If temperature compensation increases the curtain control bandwidth, the curtain position will decrease accordingly. However, outside temperature compensation 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 (triggering the outside temperature alarm), outside temperature compensation will remain inactive until the issue 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 is calculated as follows:
(10% (ΔRH) / 20%) × 50% = 25%

So, the minimum ventilation will increase to:
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 is calculated as follows:
(500 (Δ CO_2) / 1000) × 50% = 25%

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

4.10 Water consumption registration

The water consumption function monitors water usage over the last three days (including today). It uses a counter input along with a factor representing the volume of water per pulse. At midnight every day, the daily records are shifted: yesterday becomes the day before yesterday, today becomes yesterday, and the counter for today is reset.

If the controller is turned off for an extended period, this downtime is taken into account. For example, if the controller is offline for one day, the shift is adjusted accordingly.
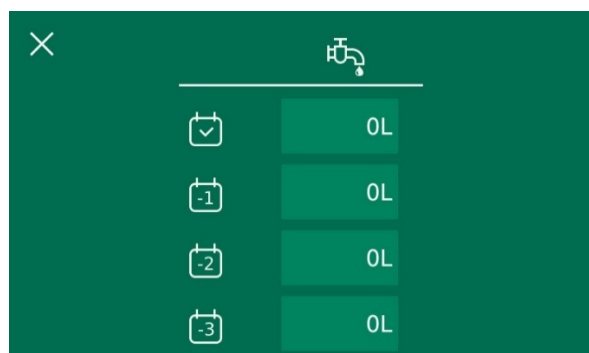
4.11 Feed consumption registration

The feed consumption function works similarly, but it monitors feed usage instead of water usage.
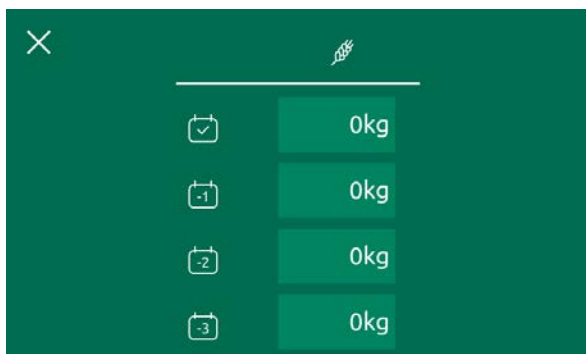
4.12 Light timer

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.
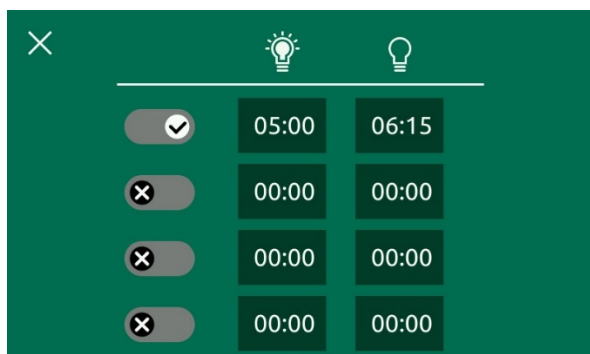
4.13 LED bar

The BO-AIR-PL is equipped with a LED bar which indicates its global state, as follows:

Flashing red – alarm

Orange – warning

Blue – controller disabled

Green, breathing – controller operational, status OK.

5 Operation

5.1 Screen layout
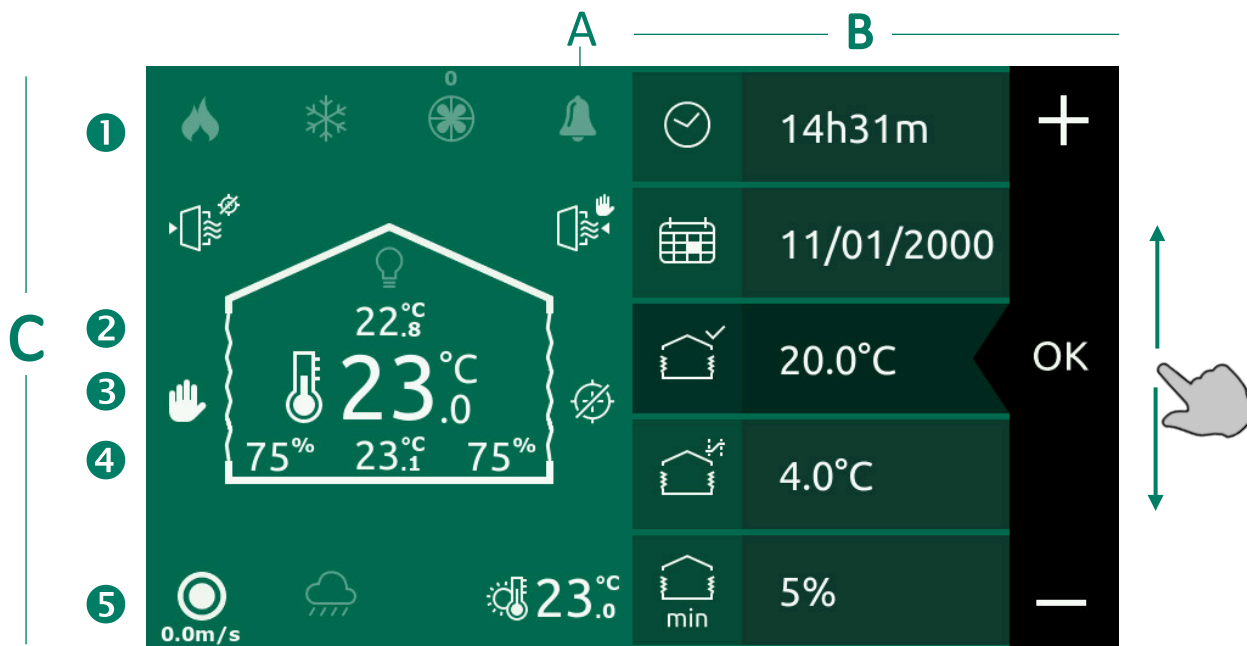
Fig. 1: BO-AIR PL screen lay-out

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

    No alarm active (icon colour is green, alarm bell colour is grey).

    An alarm is active (icon colour is red, alarm bell colour is white).

    Alarm is silenced, but not resolved (icon colour is orange, alarm bell colour 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 The main overview screen is displayed on the left side of the screen, featuring active controls with their measurements.

❶ *Heating:* Indicates if heating is active. When active, the flame icon is highlighted.
Cooling: Shows cooling status. When cooling is on or off, the ice crystal icon is highlighted (active) or dimmed (inactive). In modulating cooling mode, the icon stays highlighted while cooling modulates, with the modulation percentage shown. If Heating 2 is selected instead of Cooling, the heating icon with index "II" is displayed.
Tunnel ventilation: Indicates if tunnel ventilation is active. If enabled but inactive, the icon is grayed out. When at least one fan is active, the icon is white. The current ventilation stage (1 to 3) is shown at the top of the icon. For BP04-230V, the inlet position (%) is displayed next to the stage number. For BP04-24V, this percentage is shown with each tunnel inlet icon instead. The bottom of the tunnel icon shows the tunnelling switch delay timer, which prevents starting or stopping tunnelling while running. On secondary controllers, the tunnelling icon appears only if the primary controller is tunnelling.

❷ *House temperature front.*

❸ *Temperature.* Displays the average temperature of the left and right sides of the house.

❹   *House temperature back.*

❹   *Curtain positions left* and *right*.

⌀	*Not calibrated*: curtain motor needs to be calibrated.	✋	*Hand symbol:* hardware manual mode active via external knob <u>or</u> calibrated and in manual mode.
⊕	*Calibrate*: Calibration is performed.		*Blank:* calibrated and not in manual mode.

❺   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.

Above each curtain, a tunnel valve status is shown for BP04-24V when tunneling is active. The icon has three states for both left and right sides:
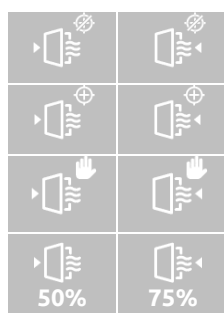
▯❄ ▯❄	*Uncalibrated.* The motor control needs calibration to operate in auto mode. Hardware manual mode always works without calibration.	
▯⊕ ▯⊕	*Calibrating.* Shown while calibration is in progress.	
▯✋ ▯✋	*Manual.* Indicates manual mode via the external knob (closing – stop – auto – stop – opening). In this mode, automatic control is disabled.	
▯ ▯ 50% 75%	*Normal operation (auto).* During normal (auto) operation, the desired valve position (%) is displayed below the icon.	

5.2   Changing settings
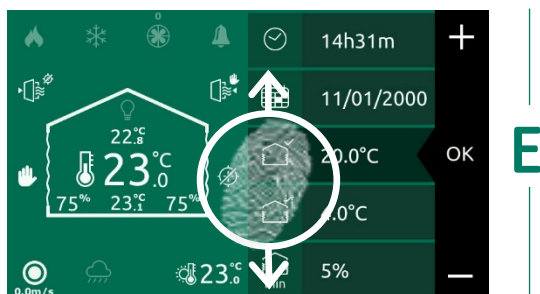
Fig. 2: Scrolling and selecting
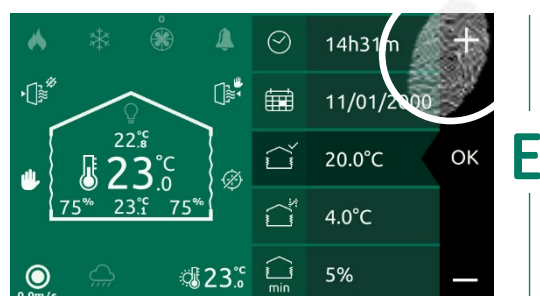
Fig. 3: Changing value using plus and minus buttons
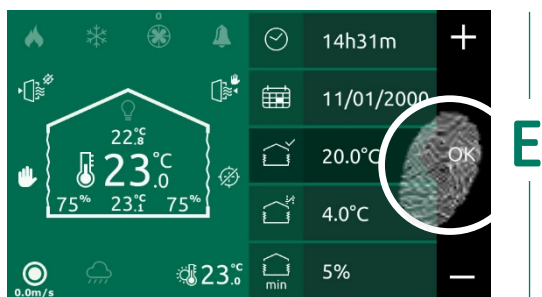
Fig. 4: Confirming settings by OK

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 and tunnel inlets 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 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
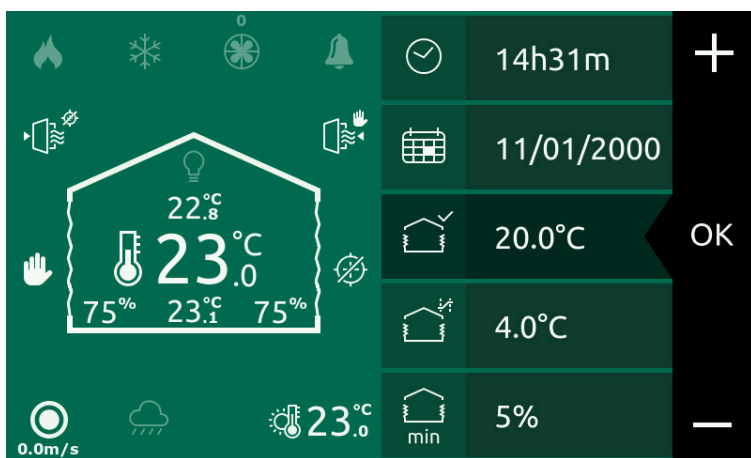
Fig. 5: Home screen

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

> ! The visibility of <u>various</u> functions depends on how the controller is configured: *Primary, Secondary*, *Follower*, or *Standalone*. If the controller is *Secondary,* the setting is inherited from the primary controller and is read-only. Additionally, if the controller is a *follower,* the setting is not visible.

6.2 24-hour overview

1	*Function ID: 1*
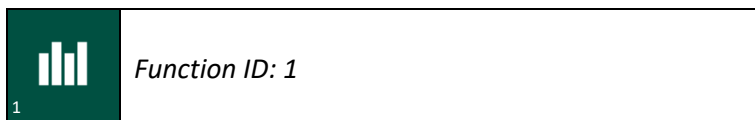
Opens the graph displaying various measurements' statuses over the past 48 hours. Different graphs can be selected using icons on the right side. To close, press the X icon in the top right corner.

6.3 Time

2	*Function ID: 2* *Input range: 00:00 – 23:59 hh:mm*
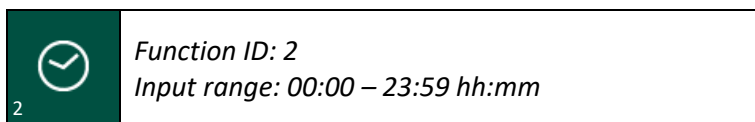
Readout of the system time which can be adjusted here.

6.4 Date

3	*Function ID: 3* *Input range: 01-01-01 – 31-12-99 dd-mm-yy*
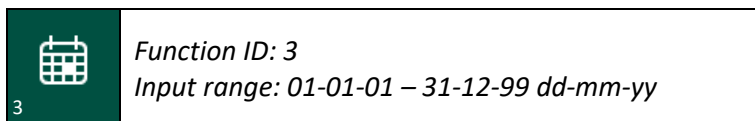
Readout of the system date which can be adjusted here*.*

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.

(i) 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

Here you set the temperature for curtain control ventilation. The temperature unit (°C / °F) can be adjusted in the installer menu. In curve mode this value is calculated from the curve.

(i) If the controller is secondary, this setting is inherited from the primary controller and is read-only. Additionally, if the controller is a follower, the setting is not visible.

6.7 Curtain bandwidth

6	Function ID: 6 Input range: 1.0°C – 20.0°C / 32.0°F – 68°F Default: 4

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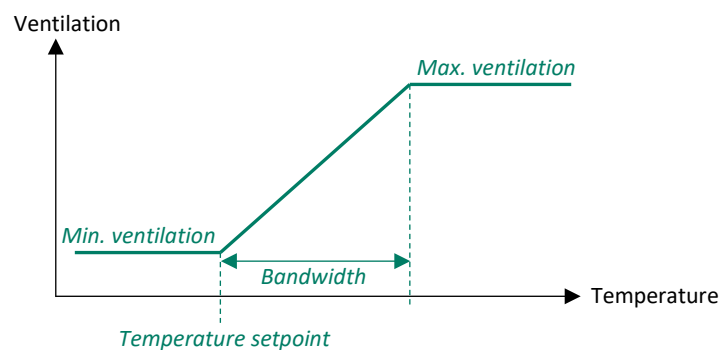
Ventilation

Max. ventilation

Min. ventilation

Bandwidth

Temperature

Temperature setpoint

(i) If the controller is secondary, this setting is inherited from the primary controller and is read-only. Additionally, if the controller is a follower, the setting is not visible.

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 value is calculated from the curve.

(i) If the controller is secondary, this setting is inherited from the primary controller and is read-only. Additionally, if the controller is a follower, the setting is not visible.

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 value is calculated from the curve.

(i) If the controller is secondary, this setting is inherited from the primary controller and is read-only. Additionally, if the controller is a follower, the setting is not visible.

6.10 Minimum temperature alarm level

| | *Function ID: 9*
Input range: 2.0°C – 50.0°C / 35.6°F – 122.0°F
Default: 15.0 |

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

(i) If the controller is a follower, this setting is not visible. Additionally, if the controller is disabled, the temperature alarm is not active.

6.11 Maximum temperature alarm level

| | *Function ID: 10*
Input range: 2.0°C – 50.0°C / 35.6°F – 122.0°F
Default: 38.0 |

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

(i) If the controller is a follower, this setting is not visible. Additionally, if the controller is disabled, the temperature alarm is not active.

6.12 Tunnel (offset) temperature setpoint

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

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

ⓘ Tunneling is not available on secondary or follower controllers. However, a secondary controller can detect if the primary controller is tunneling and adjust the curtain position accordingly when tunneling is active.

6.13 Cooling offset

12	*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 option is only visible when cooling control is enabled and the controller is either standalone or configured as the primary controller.

6.14 Cooling bandwidth

13	*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 option is only visible when cooling control is enabled and the controller is either standalone or configured as the primary controller.

6.15 RH cooling stop

14 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.

ⓘ This option is only visible when humidity control is enabled and the controller is either standalone or configured as the primary controller.

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 relay is activated when the room temperature drops below the set temperature minus the heating offset. It turns off again after the hysteresis threshold.

(i) The heating icon is shown only when Heating 1 and/or Heating 2 is enabled in the installer menu. Heating 1 and Heating 2 share this setting.

If the controller is a secondary unit and the primary has Heating 1 enabled, the setting is inherited from the primary and becomes read-only. If the primary has no heating enabled, the 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.

(i) This option is only visible when humidity control is enabled and the controller is either standalone or configured as the primary controller.

6.18 Actual humidity level

	Function ID: 17

Readout of the actual humidity level.

(i) This option is only visible when humidity control is enabled and the controller is either standalone or configured as the primary controller.

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.

(i) This option is only visible when humidity control is enabled and the controller is either standalone or configured as the primary controller.

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 option is only visible when CO_2 control is enabled and the controller is either standalone or configured as the primary controller.

6.21 Actual CO_2 level

Function ID: 20

Readout of the actual CO_2 level.

ⓘ This option is only visible when CO_2 control is enabled and the controller is either standalone or configured as the primary controller.

6.22 Maximum CO_2 alarm level

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 option is only visible when CO_2 control is enabled and the controller is either standalone or configured as the primary controller.

6.23 Light timer configuration

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 option is visible if the light timer is enabled in the installer menu and the controller is not configured as a follower.

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.

(i) This option is visible if the water timer is enabled in the installer menu and the controller is not configured as a follower.

6.25 Feed consumption status

32	*Function ID: 32*

When you select this function, a popup will appear displaying the feed used today, yesterday, and the day before yesterday. Every night at 0:00, the corresponding values are shifted by one day, and the current day resets to 0.

(i) This option is visible if the feed timer is enabled in the installer menu and the controller is not configured as a follower.

6.26 Manual mode for left curtain

24	*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.

This software manual option is separate from the also available hardware manual option, which is operated via a 5-position external switch (*close – off – auto – off – open*) on the housing of the controller. The hardware manual option always has priority.

(i) The option is available if the controller is not set as a follower. If the controller is a follower, the manual mode position is adopted from the primary controller.

6.27 Manual position left curtain

25	*Function ID: 25*

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

(i) This function is only visible when manual mode is enabled.

6.28 Manual mode for right curtain

|	
26	*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.

This software manual option is separate from the also available hardware manual option, which is operated via a 5-position external switch (*close – off – auto – off – open*) on the housing of the controller. The hardware manual option always has priority.

(i) 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.

6.29 Manual position right curtain

27	*Function ID: 27*
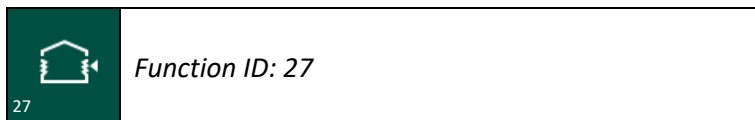
Here, you can enter the position to which the right curtain should move when manual mode is enabled.

(i) This function is only visible when manual mode is enabled.

6.30 Controller enabled / disabled

28	*Function ID: 28*

Enabled Controller
- Background color stays at default.
- All functions are fully operational.

Disabled Controller
- Background color changes to indicate the disabled state.
- All control functions are turned off and inactive.
- Manual curtain control remains available (for both primary and secondary controllers).
- A follower controller will mirror the manual curtain position of the primary controller.

Secondary and Follower Controllers
- This option is read-only on secondary or follower controllers.
- Settings automatically follow the primary controller.
- The installer menu is not accessible on secondary/follower controllers.
- If the installer menu is open on a secondary/follower when the primary controller disables it, it will automatically return to the user menu.

(i) Communication between all controllers and devices remains active at all times — regardless of whether a controller is enabled, disabled, primary, secondary, or follower. This ensures continued synchronization and data exchange across the entire system.

6.31 User manual

29	*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.
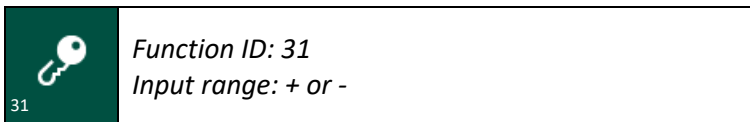
6.32 Support mode

30	*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.

6.33 Installer login

31	*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.
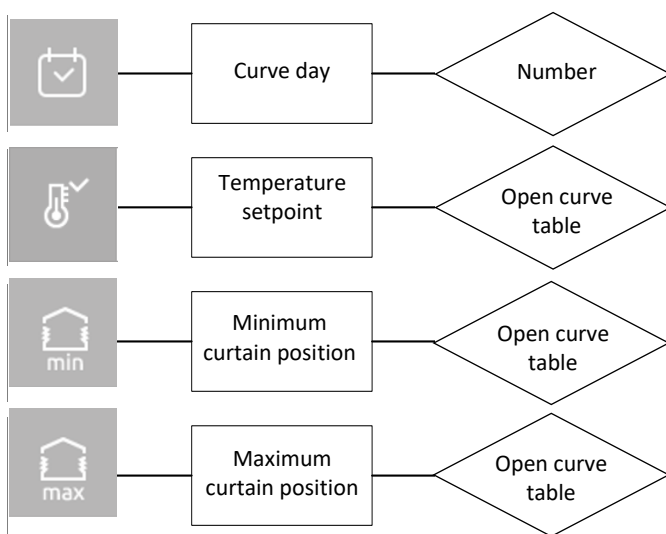
Curve table

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

(i) 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	**IO alarm:** Communication between the front and the IO board has been disrupted. No communication between BP04 and the E4 board has been established.
🌡ₗ	**Left side temperature sensor alarm:** The measured temperature on the left side is out of range. See note 1 below.
🌡ₗₗ	**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	**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.
CO_2 max	**Maximum CO_2 level alarm** If the measured CO_2 level exceeds or equals the set maximum level, an alarm is triggered.
max	**Maximum humidity alarm** The measured humidity level is higher than or equal to the set maximum level.
	Left curtain control alarm: *Motor Control Alarm – Code 4* During calibration, the time to move from closed to open is measured. In normal operation, if the motor cannot reach the target position within this time plus a 10-second margin, an alarm is triggered. The motor then stops for 2.5 minutes. During this time, the alarm cannot be cleared—only snoozed. After 2.5 minutes, the system will retry automatically. *Motor Control Alarm – Code 5* This alarm is also triggered if the measured position is outside the calibrated range with a 10% margin. <u>Example</u>: Min = 1.0 V, Max = 3.0 V Allowed range = 0.8 V to 3.2 V Any value outside this range will trigger the alarm. *Motor Control Alarm – Code 6 (BP04-24V only)* This alarm is triggered if the OMRON motor driver enters the "motor fault" state. The motor stops and remains halted until the fault is resolved.
	Right curtain control alarm: The operation of the right curtain is similar to that of the left curtain.
	Left tunnel inlet control alarm The operation of the left tunnel inlet is similar to that of the left curtain.
	Right tunnel inlet control alarm The operation of the right tunnel inlet is similar to that of the right 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.

8.3 Defect temperature sensor

If a temperature sensor (outside, front, back, left or right) malfunctions due to a broken lead (< -60°C) or short circuit (> 130°C), the last valid reading will be used for control while the sensor alarm is active.

This is a temporary measure and should be resolved as soon as possible. After the alarm is cleared and a working sensor is installed, control will resume with actual readings once the alarm is manually reset.

To ensure stable readings, a buffer of two samples is used, updated every 30 seconds by adding the newest reading and removing the oldest. When a sensor alarm occurs, the oldest buffered reading is used for control. The HMI always shows the actual sensor value—for example, -70°C to indicate a broken lead.

Temperature sensor alarms are triggered even if the controller is disabled.

Not all functions use the last valid reading: cooling and heating stop on sensor failure, but curtain control continues using the last valid value.

8.4 Defect RH or CO_2 sensor

The same principle used for temperature sensors applies to RH and CO2 sensors. An RH reading below 10% is considered defective. No maximum check is needed, as 100% is a valid reading.

For the CO2 sensor, readings below 200 ppm or above 8000 ppm indicate a defective sensor.

When a sensor is defective, the last valid reading is used for control while the alarm is active. No defect alarm is triggered if the controller is disabled.

> **!** Not all controls continue using the last valid reading. For example, cooling and heating stop completely when a sensor is defective, while curtain control continues using the last valid value.