Natural ventilation
Feature Software

Product and Documentation Changes

SKOV A/S reserves the right to change this document and the product herein described without further notice. In case of doubt, please contact SKOV A/S.

The date of change appears from the front and back pages.

IMPORTANT!

Notes concerning alarm systems

Breakdowns, malfunctions or faulty settings may cause substantial damage and financial losses when regulating and controlling the climate in a livestock house. It is therefore essential to install a separate, independent alarm system that monitors the house climate concurrently with the climate and production controller. According to EU-directive No. 98/58/EU, an alarm system must be installed in all mechanically ventilated houses.

We would like to draw your attention to the fact that the product liability clause of general terms and conditions of sale and delivery specifies that an alarm system must be installed.

In case of an operating error or inappropriate use, ventilation systems can result in production losses or cause loss of lives among livestock.

We recommend that ventilation systems should be mounted, operated and serviced only by trained staff and that a separate emergency opening unit and an alarm system be installed as well as maintained and tested at regular intervals, according to terms and conditions of sale and delivery.

Installation, servicing and troubleshooting of all electrical equipment must be carried out by qualified personnel in compliance with the applicable national and international standard EN 60204-1 and any other EU standards that are applicable in Europe.

The installation of a power supply isolator is required for each motor and power supply to facilitate voltage-free work on the electrical equipment. The power supply isolator is not included.

Note

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1 Guidelines

This manual describes the specific feature software functionality. For a general description of the controller's operation and other functions, see the controller user and technical manual.

2 Product description

2.1 Pure natural ventilation

Using Natural ventilation, the air change happens when air currents move between the adjustable air intake and the air outlet without any assistance of fans. Curtain openings on the sides of the livestock house are typically used as both air intake and the air outlet. You can also use tunnel opening, open flap in exhaust unit or ridge opening as air outlet. The mechanical regulation is solely opening and closing of the inlets and outlets. Since no exhaustion takes place by means of fans, an energy saving is achieved and the noise level in the livestock house is reduced.
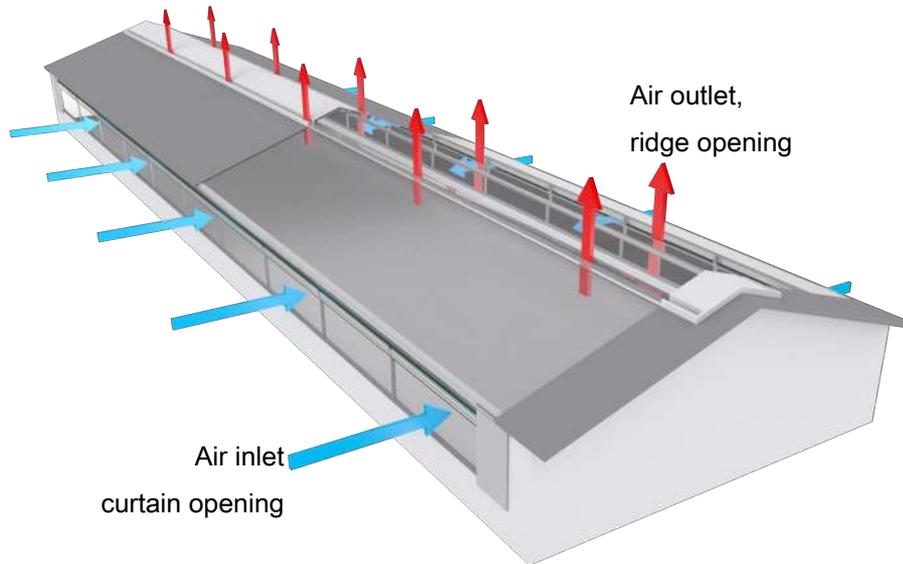
Air outlet,

ridge opening

Air inlet

curtain opening

Figure 1: For example, on a house with pure natural ventilation with curtain openings on the sides of the house and ridge opening in the roof.

2.2 Natural ventilation combined with mechanical ventilation

Natural ventilation can be combined with other ventilation principles (LPV, Tunnel, and heat recovery) depending on how the ventilation system is constructed. When the required climate can no longer be sustained using natural ventilation, the ventilation system switches to a different ventilation principle, for instance on the basis of too high or low outside temperature, too high CO_2 level in the livestock house or too high wind speeds.
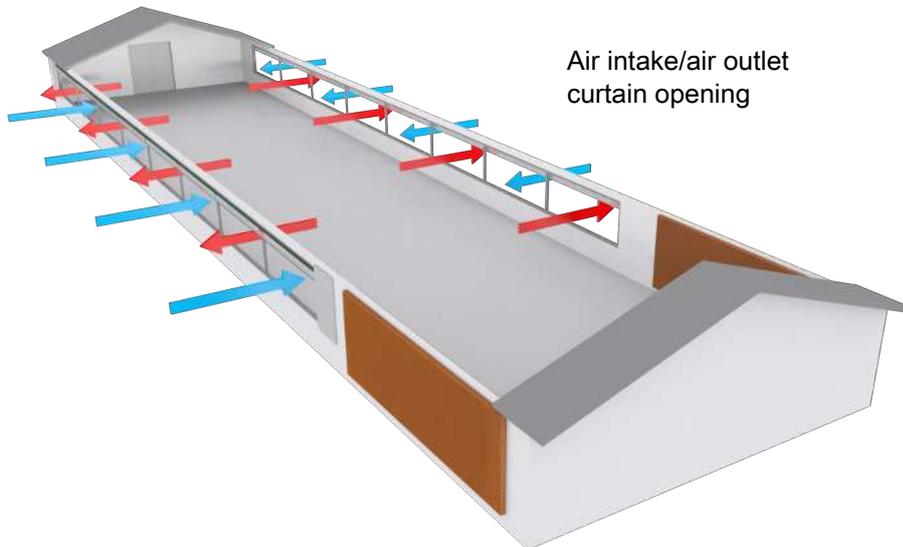
Air intake/air outlet
curtain opening

Figure 2: Example of livestock house with natural ventilation in combination with tunnel ventilation, Natural ventilation.

Air outlet, tunnel opening
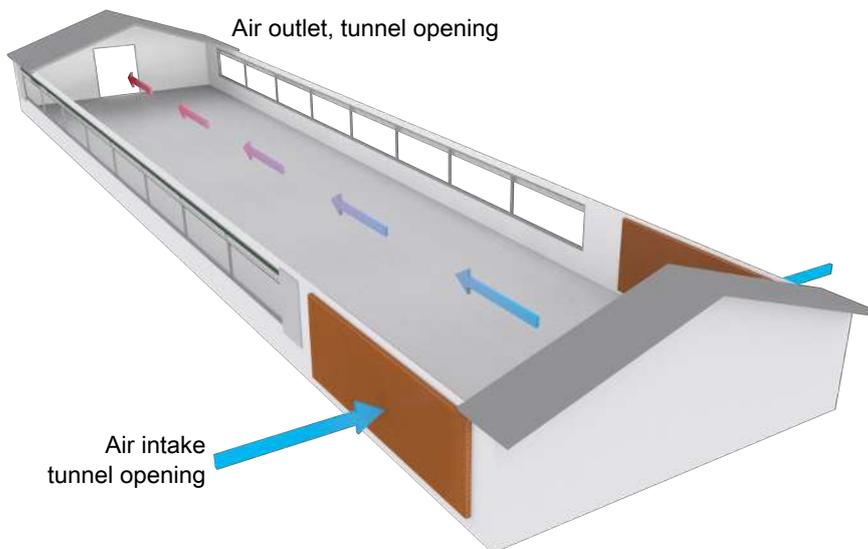
Air intake
tunnel opening

Figure 3: Example of livestock house with natural ventilation in combination with tunnel ventilation, Tunnel ventilation.

3 Product overview

136280 DOL X34 Natural, feature SW

Natural ventilation for post-installation in the climate controller already working with LPV or Tunnel system software. If natural ventilation is used with Combi-Tunnel system software, the system software must be version 6.6 or later. When loading the feature software, the new functions are added to the menus of the controller.

Feature software can be installed in controllers, version 5.2 software or later. If the controller software version is older than version 5.2, it requires an update to the latest version before the installation of the software feature.

Cannot be used for controllers with ARM CPU and IMX single core.

It is supplied with English documentation.

136270 DOL 534 Natural, Poultry Climate SW

System software. Pure Natural ventilation without the possibility of combination with other ventilation principles (LPV and Tunnel).

137284 DOL 634-1 Natural, pig climate SW

137285 DOL 634-2 Natural, pig climate SW

System software. Pure Natural ventilation without the possibility of combination with other ventilation principles (LPV and Tunnel).

136948 DOL 43X/53X/63X Update to latest version

When updating the DOL 43X/53X/63X software, the FarmOnline Explorer management program requires update to the latest version.

The controller must have an IMX Quad-core CPU to use this software.

4 User guide

Natural ventilation can be used alone or in combination with other ventilation principles.

Activation and deactivation of the function takes place according to the outside temperature can be controlled in two different ways:

- **Relative values:** Start/stop are relative to the outside temperature settings and therefore follow the outside temperature.
- **Absolute values:** Start/stop are fixed values that do not change according to the changing outside temperature.
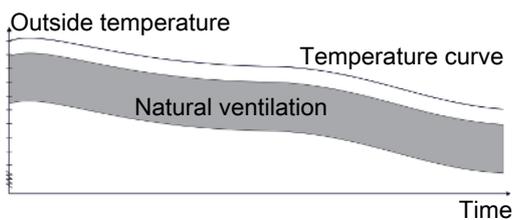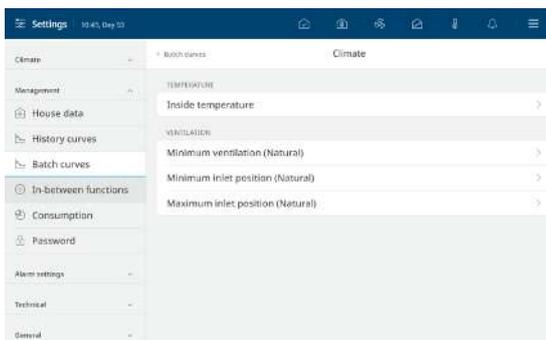

Start/Stop conditions by = Relative values.
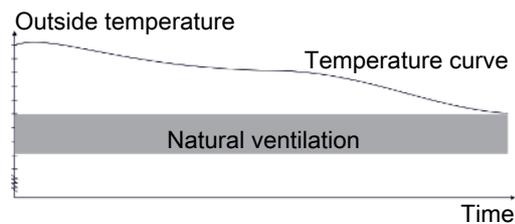
Start/Stop conditions by = Absolute values.

The settings options and contents of the menus depend on which **Start/Stop conditions by:** has been selected. See also Setup of natural ventilation [▶ 16].

Natural ventilation can be adjusted by means of the batch curves in **Management | Batch curves | Climate | Ventilation**.

Setting an opening percentage for minimum and maximum opening of the air inlet, respectively.

It is also possible to adjust each inlet in relation to the curve in the table found under **Climate | Ventilation | Natural | Inlet Min./Max. opening**.

Scroll right/left in the table to see all values and settings.

Climate | Ventilation| Minimum ventilation settings

Minimum ventilation natural	Menu for setting in per cent of air inlet and air outlet opening. Lower limit for how little opening you can have in Natural ventilation mode.
	When **Minimum ventilation natural** is set to a value exceeding zero, the air inlet and air outlet cannot close completely.

Climate | Ventilation | Natural

Inlet Min./Max. opening	Menu for setting minimum and maximum opening of the air inlet.
	See example below.
Natural setpoint incl. addition	Indication of corrected temperature value for **Temperature setpoint + Wind comfort (or** Comfort).
Inlet cycle timer	Setting the amount of time it takes both to open and close.
Cycle time inlets	Menu for setting batch curve for cycle time.
	Setting day numbers and the time that the air intake must be open. The Close time is calculated (**Inlet cycle timer - Open-time**).
Cold protection offset	Setting an offset to **Setpoint temp**.
	When the inside temperature is too low, all natural inlets close and remain closed until the inside temperature is high enough again.
	If the **Temperature setpoint** is 19 °C and the temperature drops below the cold protection offset, for example 5 °C (i.e. 19– 5 = 14 °C), all natural inlets close until the temperature again exceeds 14,5°C (the 14 °C + 0.5 °C).
Cold protection starts below	Display of the inside temperature where the cold protection starts.

To ensure distribution of the fresh air during minimum ventilation, **Cycle temp.** is used. When the inside temperature drops below the **Cycle temp.** for the respective inlet, this inlet will cycle between closed (**Min. Opening**) and open (**Inlet pos.**) which is set in the menu **Inlet Min./Max. opening**.

In the following example, inlet 5 will cycle between 16 % and 23 % when the inside temperature is below 21.5 °C.

Inlet	...	Min. opening Batch	Min. opening	...	Cycle temp.	Inlet pos.
1	...	15	10	...	19.5	20
2	...	15	10	...	19.5	20
3	...	15	12	...	19.5	22
4	...	15	15	...	19.5	25
5	...	15	**16**	...	**21.5**	**23**
6	...	15	19	...	21.5	20

Climate | Ventilation | Natural

Natural, information blocked	Indication of the reason why it is not possible to apply Natural ventilation.
Natural forced-to-start input	If a 3rd party sensor (e.g. daylight) is connected, Natural ventilation is automatically activated when receiving a signal from it. If the function is unavailable, the status is **Inactive**.
Natural forced-to-stop input	If a 3rd party sensor (e.g. rain) is connected, Natural ventilation is automatically deactivated when receiving a signal from it. If the function is unavailable, the status is **Inactive**.
Stop Natural at outside temperature above	Setting of the high outside temperature where natural ventilation stops (**Temperature setpoint+ High outside temperature offset**). When controlled by **Relative values**, this is just a display.
Start Natural at outside temperature below	Indication of the high outside temperature where Natural ventilation starts (**Temperature setpoint + High outside temperature offset - High outside temperature hysteresis**).

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|	
Start Natural at outside temperature above	Indication of the low outside temperature where Natural ventilation starts (**Temperature setpoint + Low outside temperature offset** + 2 °C).
Stop Natural at outside temperature below	Setting of the low outside temperature where Natural ventilation stops (**Temperature setpoint + Low outside temperature offset**). When controlled by **Relative values**, this is just a display.
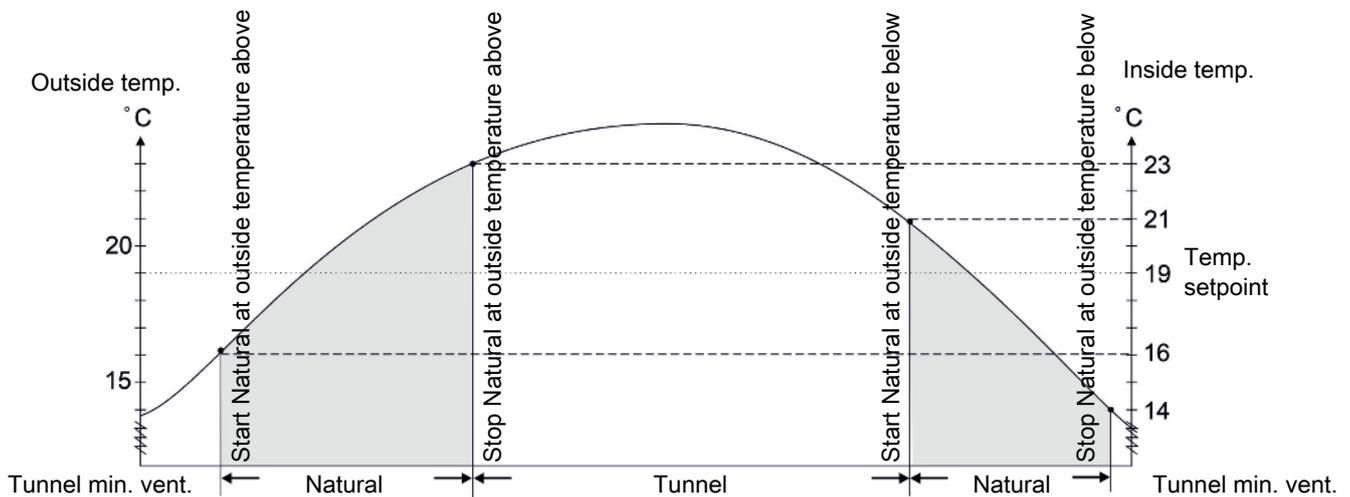
Figure 4: Natural ventilation is active dependent on the current outside temperature. Temperature setpoint is 19 °C.

|	
High outside temperature offset	Setting of a number of degrees added to the **Temperature setpoint** to establish an upper limit for the outside temperature. When outside temperature is above limit, ventilation switches from Natural ventilation.
	By changing this offset, you change the high temperature which starts and stops Natural ventilation. Make the setting higher to switch to Natural ventilation at a higher temperature.
High outside temperature hysteresis	Setting of a number of degrees which postpones the switch to Natural ventilation at decreasing temperature. This makes regulation more stable so it does not constantly switch between the various ventilation principles.
Low outside temperature offset	Setting of a number of degrees subtracted from the **Temperature setpoint** to establish a lower limit for the outside temperature. When outside temperature is below limit, ventilation switches from Natural ventilation. Make the setting higher to switch from Natural ventilation at a lower temperature.
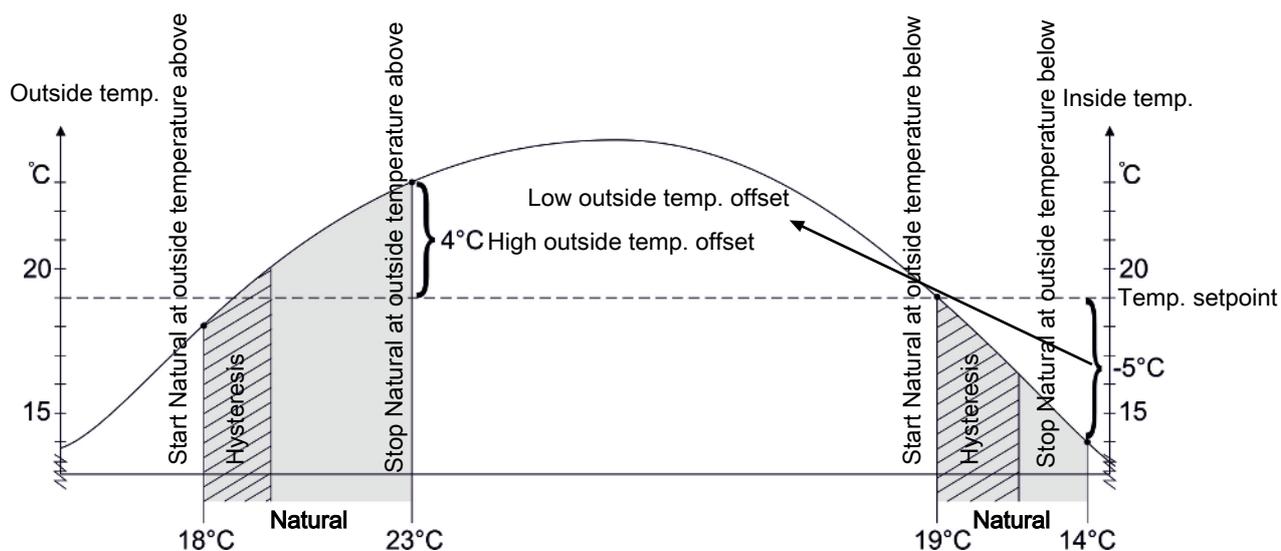
Figure 5: Natural ventilation is active dependent on the current outside temperature.

4.1 Natural ventilation using CO2 sensor

Using a CO_2 sensor, the current CO_2 level in the livestock house can be monitored and used as an indicator of the air quality.

Climate | Ventilation | Natural

Maximum CO2 level	Setting the upper CO2 limit.
	When the limit is exceeded, the controller switches to mechanical ventilation using the fans.

4.2 Natural ventilation using weather station

When Natural ventilation is combined with a weather station, it is possible to take the current wind direction and wind speed into account when adjusting the ventilation.

Climate | Ventilation | Natural

Inlet maximum opening	Indication of the maximum allowable opening of the individual air inlets.
	The controller calculates the opening based on the current wind direction and speed. It reduces the opening of the air inlets in the windward side and increases the opening in the leeward side.
Wind comfort at 15 m/s	Setting of a number of degrees added to **Temperature setpoint** to minimize any draught problems in case of strong wind.
Wind comfort	Indication of the number of degrees that have currently been added to **Temperature setpoint**.
	The controller calculates a gradually increasing wind comfort. This is calculated based on the current wind speed (no addition at 0 m/s and maximum addition (4 °C) at 15 m/s). The addition is also corrected regarding wind direction (no addition in case of wind direction along the livestock house to maximum addition if wind direction varies from 60° to 90°).
Storm limit	Setting the upper wind speed limit.
	The controller switches to ventilation using fans at the preset wind speed (when other ventilation is available).

| Maximum opening limit at high wind speeds	Setting an opening limitation for the air inlet at high wind speeds (opening in per cent).
Maximum opening limit start wind speed	Setting the wind speed which is to activate a limited opening of the air inlet (wind speed, 5 m/s). The air inlets can open 100% until the wind speed reaches this limit.
Maximum opening limit stop wind speed	Setting the wind speed where the full opening limitation of the air inlet has been reached (wind speed, 10 m/s). The air inlet can as a maximum open 30% when the wind speed reaches this limit.
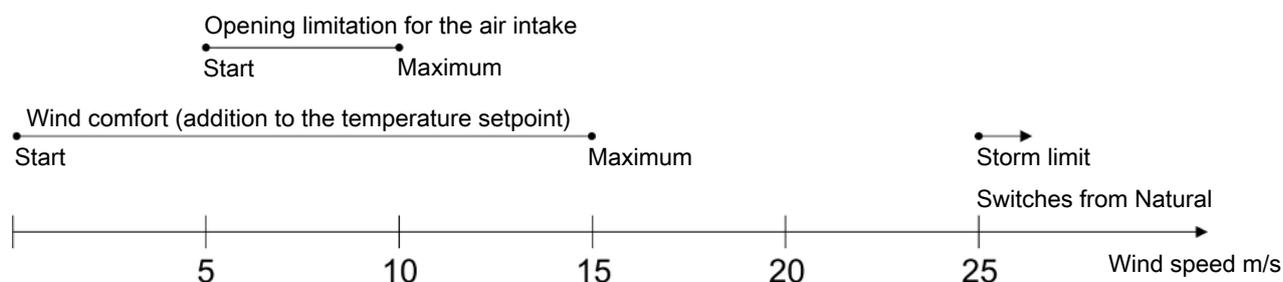
Figure 6: Natural ventilation at increasing wind speeds

To counteract draft at increasing wind speed the controller adds a number of degrees to the temperature set-point. It also gradually reduces the opening of the air inlets.

The opening of the air inlets is also determined by the current wind direction. The opening is thus reduced on the side of the livestock house where the wind comes from.

See also the section Weather station for a description of weather station.

4.3 Alarm settings
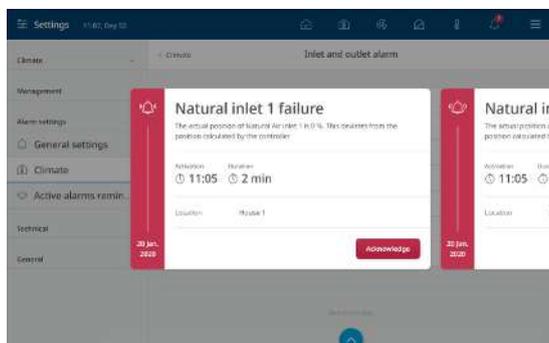
When Natural ventilation is installed, it is possible to get an alarm when the inlet and outlet differs from the required position.

Select the menu ☰ ⚏ **Alarm settings | Climate | Inlet and outlet alarm**

Inlet and outlet alarm	The inlet and outlet alarms are technical alarms. The controller triggers an alarm if the actual flap position on the air inlet or air outlet deviates from the setpoint that the controller has calculated as correct.

5 Technical setup

5.1 Installation guide

5.1.1 Feature software

The Feature Software is provided on a USB stick.

Important information

Feature software can only be installed on house controllers with software version or later.

The controller restarts after loading the feature software so it is not advisable to carry out the upload when there are animals in the livestock house.

If it is necessary to load the software while animals are in the house, it should be carried out in the presence of a veterinary expert.

Working procedure when installing Feature Software

1. Create a backup copy of the controller settings.
2. Load feature software and wait for the house controller to restart.
3. Activate the function.
4. Set up the function in the house controller.
5. Make the settings.

5.1.1.1 Backup of settings

Save the controller settings and pages before loading the software.

Select **Save** in the menu **Technical | Service | SD card.**

Confirm and wait until the controller indicates that the settings are saved.

5.1.2 Loading software

1. Loosen the screws (**A**) that hold the front panel in place.
2. Lift out the front panel. Make sure not to pull the flat cable so that the plug (**B**) is damaged.
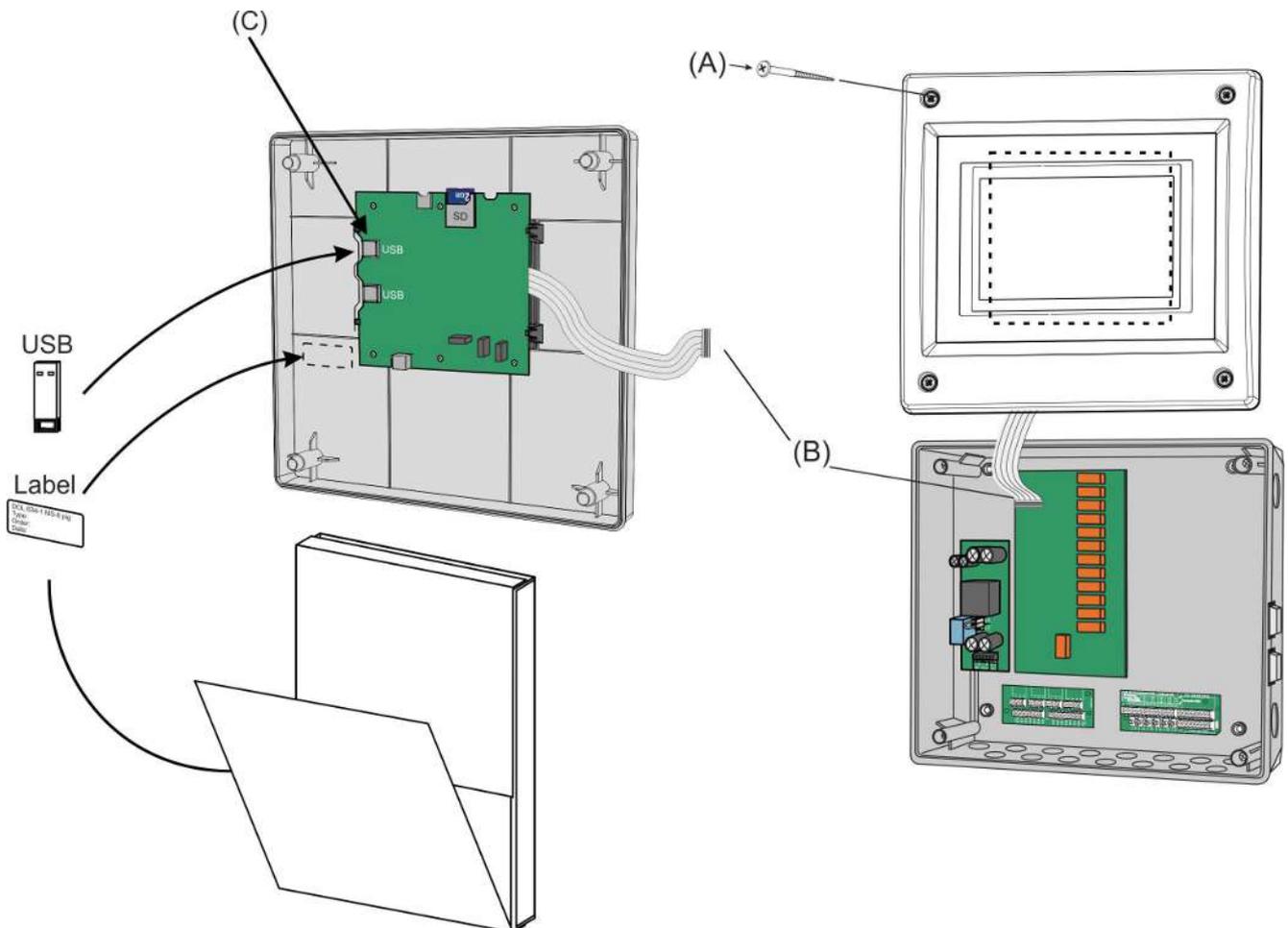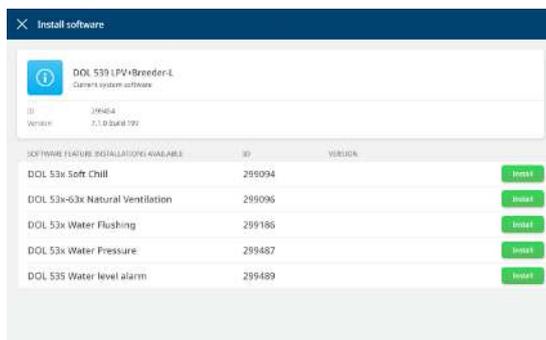

Figure 7: Loading software

3. Unpack the USB stick and label from the box.
4. Place the small accompanying label at the side of the CPU module.
5. Insert the USB stick containing the software in the USB port (**C**) on the CPU module.

In the menu Technical | Service | Install software

Select the required software.

Installation begins.

Settings are automatically saved before the installation starts and are loaded after the restart.

The controller restarts during installation.

> ⚠️ It is VERY important not to disconnect the power supply during installation.
>
> Do not remove the USB memory stick until the installation is fully completed. In other words, when the graphical user interface is accessible and usable.

5.1.3 Setup of natural ventilation

| Installation | Manual installation | Climate | Natural ventilation

| Natural temperature sensors setup	Location of temperature sensors for air inlets.
Natural outlet setup	Regulatory interlinking of air inlet and air outlet
Start/Stop conditions by:	Selecting start and stop conditions for Natural ventilation.
	Relative values: Start/stop is relative to the setting and therefore follow the related batch curve, see also the User manual for the climate controller. **Absolute values**: Fixed values that are not changed during the batch course. Only changed by means of operation.

At Natural ventilation, the opening of the air inlets is adjusted based on the input from the inside temperature sensors - and possibly a weather station. The livestock house can be divided into areas. Each area can be connected to one or several temperature sensors.
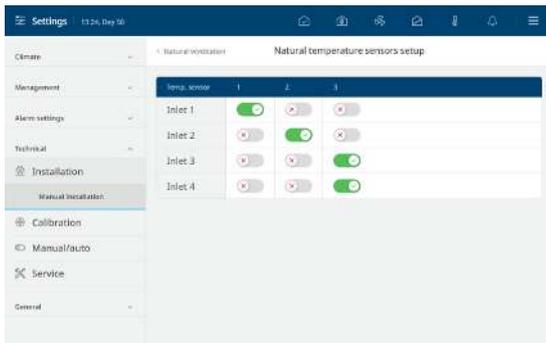
Setup of temperature sensors

You can set up several temperature sensors in the livestock house to register the temperature in each zone.

If several sensors are being used for the same inlet, the same inlet, the controller calculates an average temperature according to which the controller carries out the regulation.
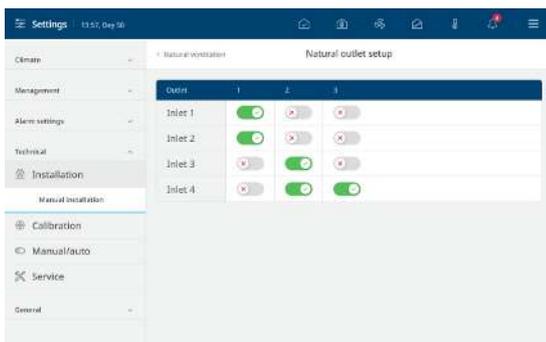
Setup of air outlet

The air outlets are controlled in relation to an average reading of the opening of the selected air inlets.
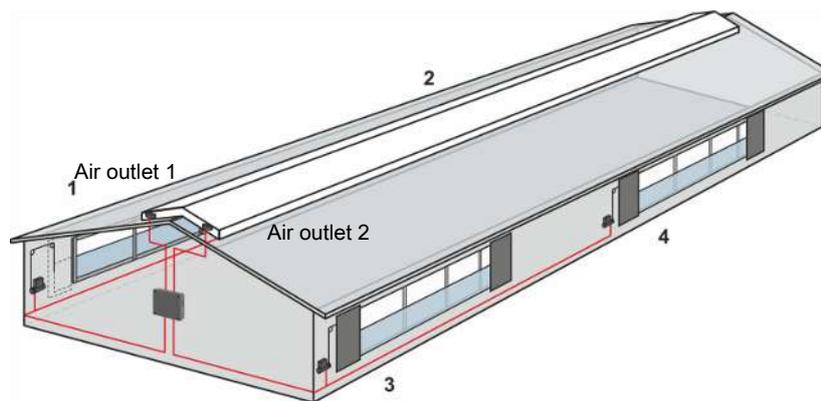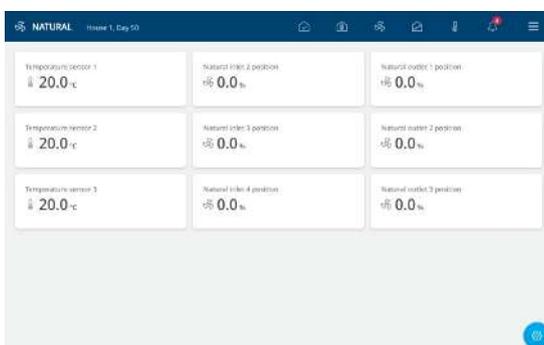

Figure 8: Setup of page with natural ventilation

It can be advantageous to set up a page to reflect the installation in the house.

The temperature sensors have a central placement on the display to indicate their placement in the house. Next to each sensor, you find air inlet which is connected to the sensor in question.

5.2 Calibration

5.2.1 Calibration of Air Intake and Air Outlet

The controller must be adapted to the winch motor after installation.

Winch motors with feedback must be calibrated by a technician, while winch motors without feedback are calibrated automatically once the technician has set up a time for Air inlet time.

During the automatic calibration, the air inlets/air outlets open and close completely for a short time and then return to the position which the controller calculates.

The change-over switch on the winch motor must be se to AUT.

5.2.1.1 Winch motor without feedback

Time	Setting of the time of day when the automatic calibration shall run.
Running time	Setting of the time it takes to run from fully open to fully closed.
Runs before recalibration	Setting of the number of times the inlet flap has to run before it calibrates automatically.
Minimum voltage **Maximum voltage**	When the air inlets or air outlets are 0-10 V controlled, the output voltage can be adjusted via **Min. voltage** and **Max. voltage.**

1. Select the menu ☰ 🞂 **Technical | Calibration | Climate | Side inlets | Calibration**.

2. Select **ON** to start calibration.
3. Check that the correct inlet(s) open(s) and close(s) correctly.
4. Wait until the calibration is finished and the display shows **Calibration ended** again.

Calibration of other air inlets and air outlets are carried out in the same way.

5.3 Testing

After installation of the system a thorough test must be carried out, to ensure that the system works as intended.

5.3.1 Testing Natural air inlet and outlet

The test is to show whether air inlet and air outlet can open and close completely.

Select the menu ☰ ⬍ **Technical | Manual/auto.**

Then select **Climate | Natural | Natural inlet 1** and activate **Manual mode**.

Set 100%.

Check that the correct air inlets open completely.

Set 0%.

Check that the correct air inlets close completely.

Set the air inlet to the required setting.

Repeat the test for the installed air inlets and outlets.

5.4 Maintenance guide

There is no maintenance of software.

The functions from a feature software are not overwritten by a subsequent software update, but are updated together with the latest update.

It is not possible to uninstall feature software once it is installed.

5.5 Technical data USB

Network		
USB		USB 2.0 A type
Variant		
Controllers		DOL 534/539, DOL 634/639
Animals		Poultry, pigs
Software version		DOL 534/539: 6.6 or later
		DOL 634/639: 7.0 or later
Environment		
Operating temperature	°C (°F)	-40 to +40 (-40 to +104)
Storage temperature	°C (°F)	-40 to +70 (-40 to +148) – and protected against direct sunlight.
Shipment		
Dimensions crated H x W x D	mm	340 x 265 x 30
Shipping weight	g	210