Introduction Model

Omnia

Features / Highlights

1) Communication

2) Sensors

3) Automation

4) Updates via OTA
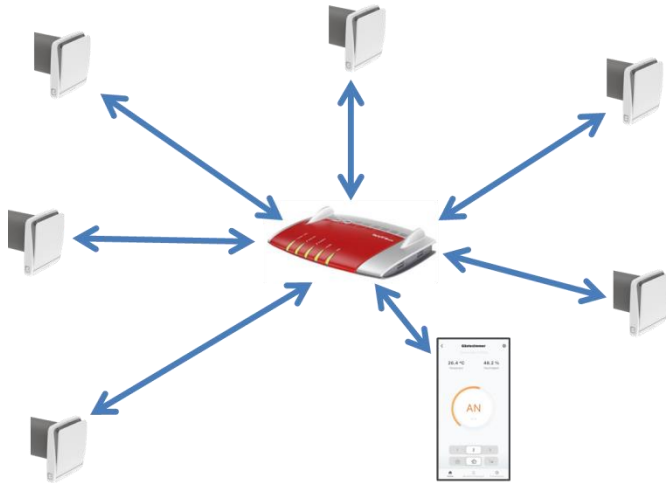
5) App-based control

Communication

ESP-NOW Long Range

Mesh

Range

Communication



Standard-Konfiguration (STERN)

The default configuration can often lead to connectivity issues, especially when repeaters are used.

The ventilation system relies on the customer's Wi-Fi infrastructure, which is often suboptimal. "Dead zones" can cause device failures and lead to user dissatisfaction.

To improve the situation, Haplabit has developed a communication solution specifically designed for decentralized ventilation systems, incorporating two technologies.

Kommunikation

Konfiguration HAQCS2
MESH

ESP-NOW long range

Zu entfernten
Geräten
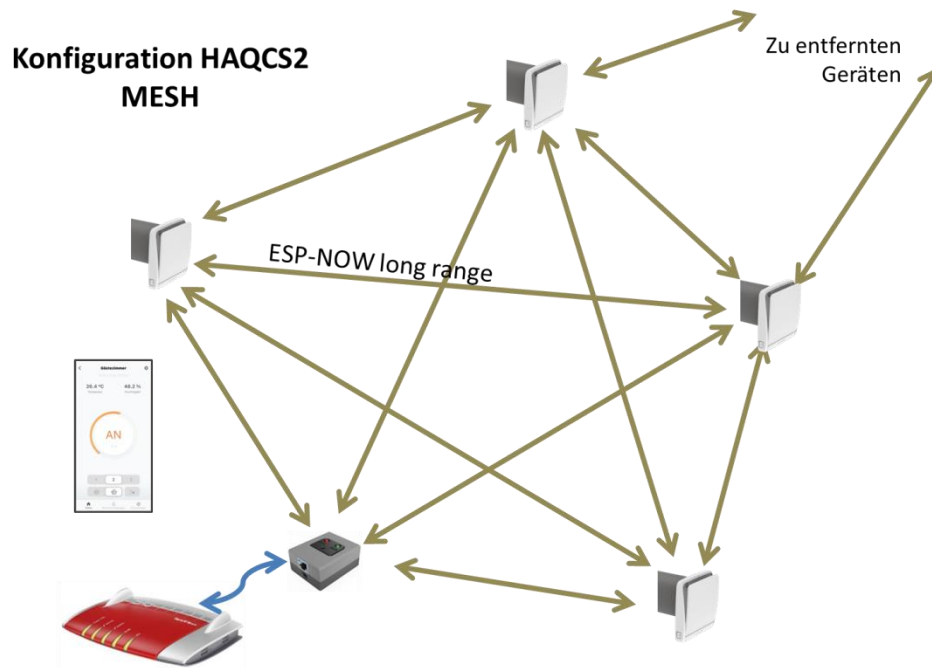
The ESP-NOW long-range protocol offers 60% greater range without increasing transmission power.

A mesh protocol specifically developed for decentralized ventilation units enables communication with all devices on the premises (e.g., throughout the entire house) without relying on the customer's Wi-Fi infrastructure.

For communication with the smartphone and the internet, a gateway is used. It is connected to the router or a switch via cable and acts as a member of the mesh network.

Communication

Advantages:

1. Long range improves coverage — for example, signals can pass through 5 walls instead of just 3.

2. Mesh networking enables communication with devices that are even farther away, such as in a guest house.

3. Independence from the customer's Wi-Fi network and its quality, while still allowing access to internet-based information.

Communication
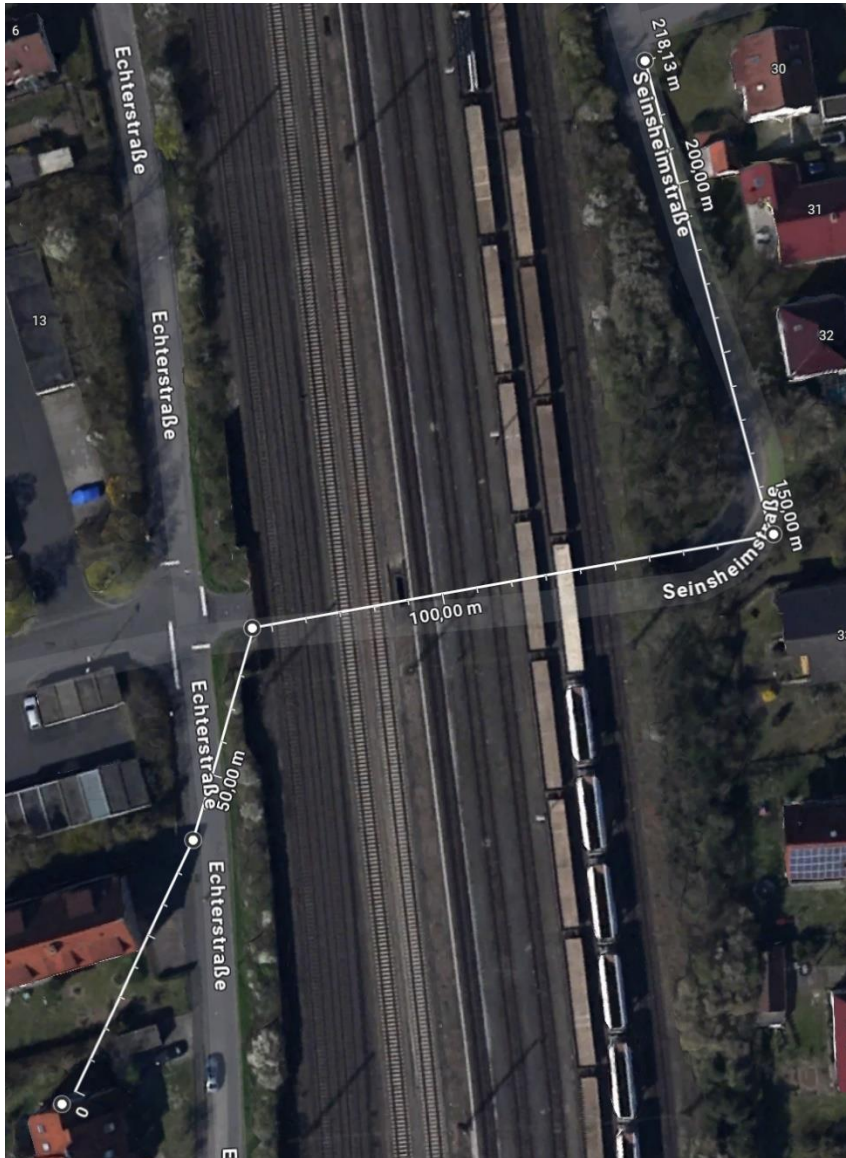
Example 1

Communication over more than 200 meters distance through a tunnel beneath railway tracks.

Example 2

In an attempt to communicate through 12 garages (i.e., 24 thin concrete walls), 50% of the data packets were still transmitted.

Sensors

Carbon dioxide

TVOC

Humidity

Temperature

Brightness

Carbon dioxide CO_2

The Omnia model is equipped with all (hence the name Omnia) important sensors for air quality.

Measuring carbon dioxide allows the device to independently monitor the air quality, since the concentration of CO_2 — as a measure of how "**used**" the air is — represents the most important criterion for ventilation. This is the unique selling point of the Omnia model, with far-reaching implications. Only devices that can determine how "used" the air is can be meaningfully automated.

The TVOC sensors used by other manufacturers measure the level of air **pollution** — a parameter not connected to CO_2 (although marketing claims often suggest otherwise).

Can TVOC sensors replace a CO_2 measurement??

The result of the TVOC measurement can be output as "eCO_2" or "CO_2 equivalent." However, this refers to an equivalent in the ability to absorb infrared radiation, thus contributing to the greenhouse effect — a criterion with no relation to breathable air hygiene.

Some manufacturers use the association with CO_2 to claim that their ventilation devices know the CO_2 concentration because they are equipped with TVOC sensors. It's like trying to measure temperature with a ruler.
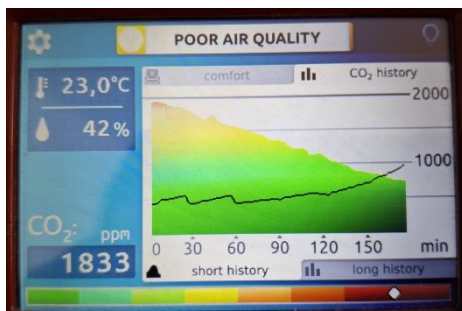
In practice, it can be seen that TVOC (black line) and CO_2 (top edge of the colored area) not only have different values but often show different trends as well.

Sensors

TVOC (Total Volatile Organic Compounds)

Although TVOC sensors do not provide any information about CO_2 concentration, they are also used here. The Omnia model uses TVOC sensors, which measure the **pollution** of air with organic substances, and takes this into account in the control system.

TVOC detects substances such as cooking odors, cigarette smoke, alcohol vapors, sweat, paints, emissions from furniture, carpets, plastics, and so on.

The user has the option to determine the weighting with which these substances are taken into account in the control system. In an office, TVOC may be from coffee aroma or perfumes — here, TVOC can be ignored. In a hobby room, it could be solvents or other harmful substances.

Temperature and humidity

The combination of temperature and humidity forms the indoor climate. People feel comfortable within a certain range.

Comfort as a function of air humidity and air temperature
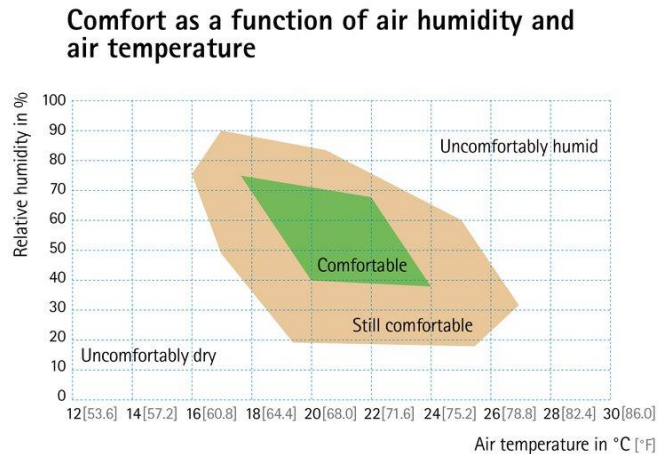
Too low relative humidity irritates the mucous membranes, while too high humidity is perceived as stuffiness.

It becomes even worse when condensation forms in cold spots in rooms, leading to mold growth. A ventilation device can detect such dangers and prevent them by increasing ventilation (even when air quality is good).

Omnia is equipped with sensors for relative humidity. Additionally, it has access to outdoor air data obtained from the internet. Based on this information, it initiates a dehumidification action when needed.

The current indoor climate data is displayed in the app.

Sensors

Brightness

Omnia can display the ventilation strength as a colored glowing area on the front of the device, if desired. To prevent this from being disturbing at dusk, the brightness is adjusted. In darkness, this display turns off.

To enable this function, Omnia is equipped with a brightness sensor.

Automatic control

Weighting CO_2/TVOC

Ventilation intensity

Night rest

Dehumidification

Filter monitoring

Smart Home unnecessary

Automatic control

Omnia is intended to become the most advanced ventilation device in the lineup. It should be equipped with the ability to make the right decisions without relying on human intervention. It should not be overloaded with many modes that require the user to activate or program them, but simply **ventilate as needed**.

Example 1: People leave the room. They no longer produce CO_2 or release other substances. The ventilation continues to run for a certain time, and once the air has been cleaned, the fan stops and the flap closes. No more unnecessary heat loss. The user doesn't have to do anything.

Example 2: Residents come back home. The air quality in the living room and children's room begins to deteriorate. The fans start in these zones and adjust the airflow according to the air quality. They operate as long and as intensively as needed to keep the air quality from reaching problematic levels. People don't need to worry — the ventilation system knows what to do.
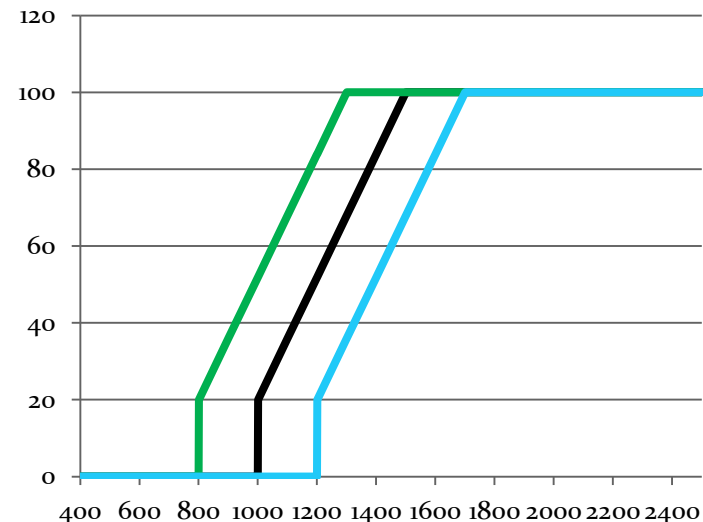
Ventilation intensity

The user has 3 profiles to choose from.

Fresh:
green

Ventilation is frequent. The devices start ventilating at relatively low pollutant concentrations.
The concentrations remain very low.
Heat loss is relatively high.

Silent:
blue

Ventilation is relatively infrequent. The ventilation only starts at relatively high pollutant concentrations (but still within an acceptable range).
The concentrations are relatively high (but still acceptable).
Heat loss is minimal.

Middle:
black

A compromise between the previous profiles.
The concentrations are in the medium range.
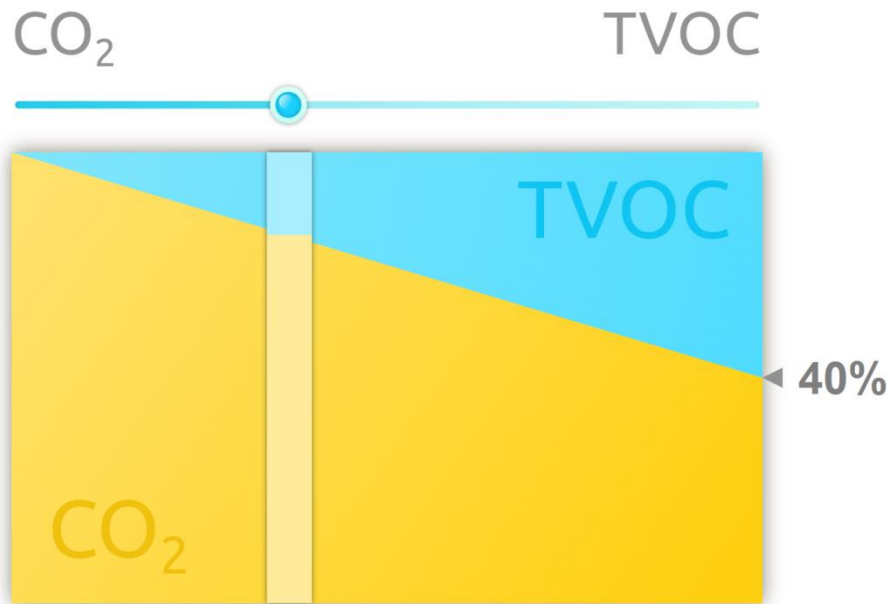*Heat loss is in the medium range.*

Dependence of airflow (in %) on CO_2 concentration

Ventilation intensity - CO_2 vs. TVOC

Air quality is determined both by CO_2 concentration as the primary factor and by TVOC as a secondary factor. The user can decide to what extent TVOC should be taken into account.

The importance of TVOC can vary in different zones. In vulnerable areas, a higher weighting can be set to reflect the conditions present there. The weighting for TVOC can be set from 0% up to 40%.

A weighted mix of both values is used for the control.

Automatic control

Night rest

2:59

In fact, there is no reason not to continue using full automation in the bedroom during sleep. Since the CO_2 output of sleeping persons is low, the fan speed is unlikely to rise to high levels that would make the fans noticeable.

However, for sensitive individuals, a sleep mode has been provided. The devices run at a low, constant speed without regulation. The user programs the times for this mode.

Outside the programmed time (or in other rooms, such as a guest room), sleep mode can also be manually activated at any time for 8 hours.

Automatic control

Summer mode

If no air conditioning is used, it's important not to trap heat inside the home during summer. In situations where the indoor temperature is higher than the outdoor temperature — due to sunlight, for example — it makes sense to activate summer mode. In this mode, one fan draws in outside air while another expels indoor air. Ideally, the intake should come from the cooler side of the house.

Omnia automatically switches to summer mode — if the user permits — when indoor and outdoor temperatures make it worthwhile. This creates a certain passive cooling effect.

Automatic control

Dehumidification
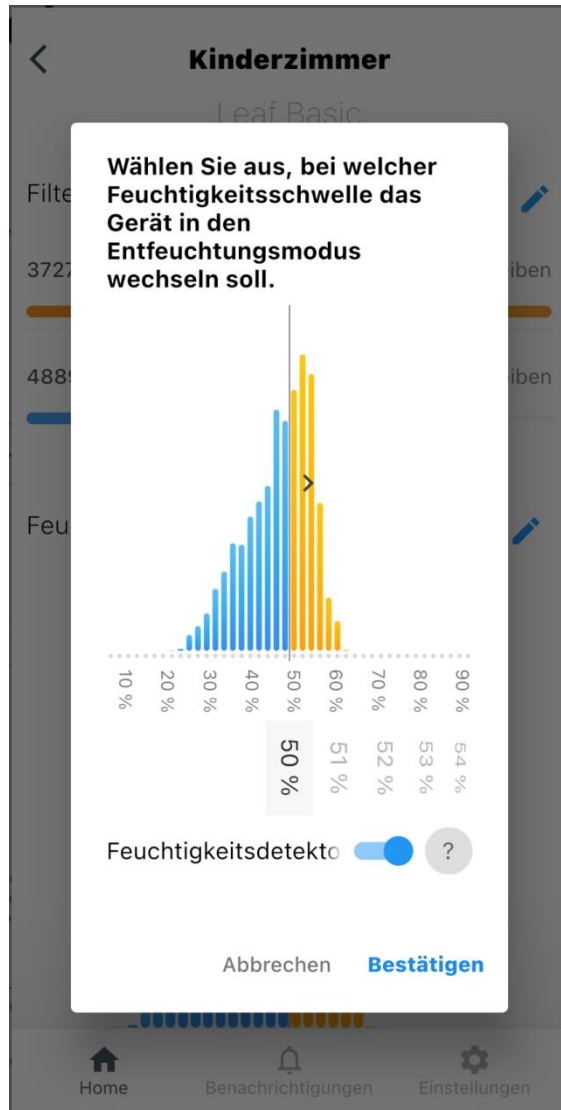
The risk of mold forming in a home arises when moisture condenses on cold surfaces. This can be prevented by avoiding cold spots (through proper insulation and heating) and by controlling the humidity level in the air. This risk occurs during the colder seasons, even though relative (and also absolute) humidity is often higher in summer.

Ventilation units often recover not only heat but also moisture. To perform dehumidification, the system switches to a special mode and increases the air exchange rate.

The app provides the user with a statistical distribution of humidity levels in each zone over the past weeks. Based on this, the user can set a humidity threshold. If this threshold is exceeded, the device checks whether dehumidification makes sense and may start the process. Dehumidification is not sensible if the outdoor air carries more moisture than the indoor air, or if the dew point is lower than the outdoor temperature plus a safety margin.

Automatic control

Smart home unnecessary

The automation ventilates whenever and as intensively as the air quality requires. Neither humans nor smart home systems can do this better than the devices that continuously monitor the air with sensors.

Humans have no sensory organs for carbon dioxide, and they become accustomed to substances with odors when the concentration increases gradually.

And what could smart home systems do better than Omnia's automation?

- If the air quality is good and the automation has stopped the fans for that reason — turn them on? For what purpose? Just to cause heat loss?

- If the ventilation is running due to poor air quality — turn it off? Why?

Update via the Internet

Information in the app

update via the app

Update via the Internet

Updates via the Internet(OTA)

The app can be updated as usual. The ventilation devices of the Omnia model, as well as the gateway, also have the ability to update their firmware via the internet.

The app displays the status when a new update becomes available. The user also receives information about what the update does. They can then easily initiate the updates within their groups.

An additional feature also allows the user to roll back to a previous version. This gives them full control over the software status of their ventilation devices.
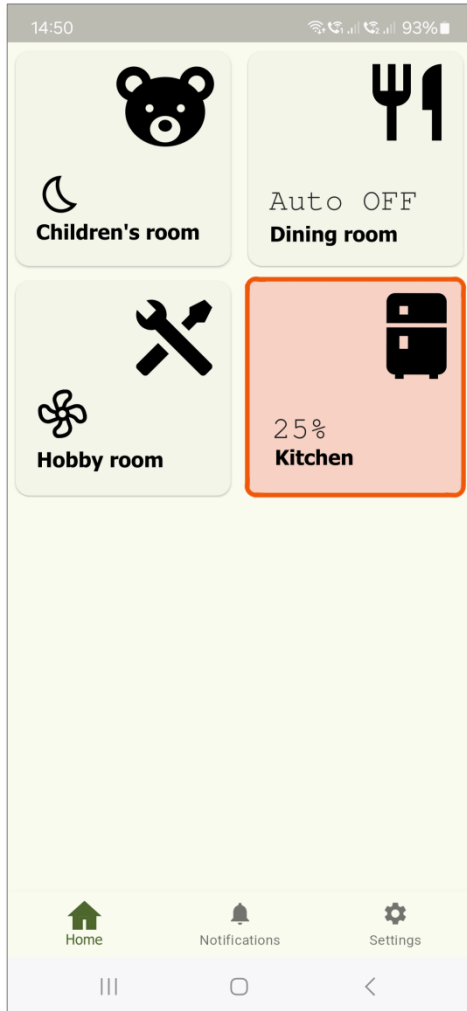
The App

Group/Zone display

Group control

Measurements

Settings

The App
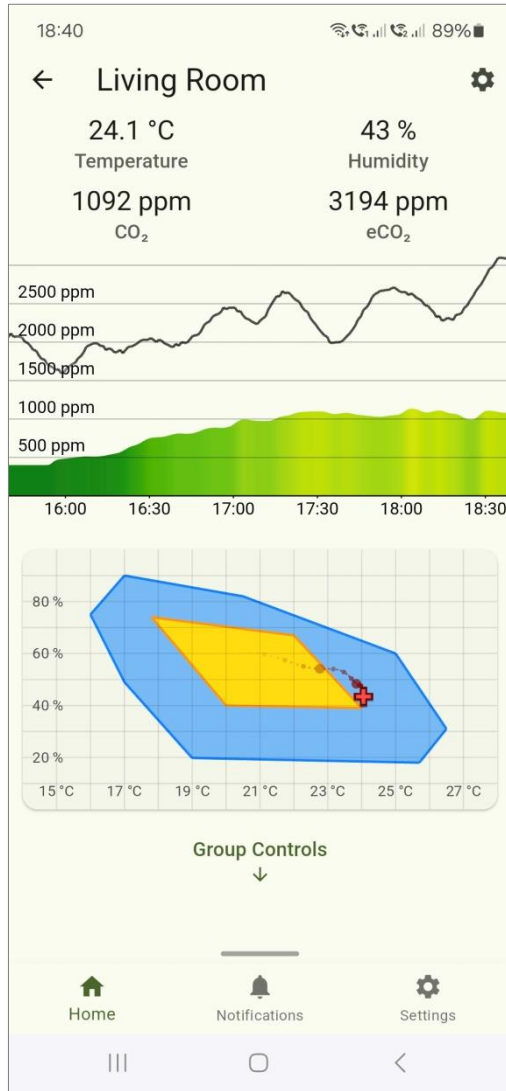
Display of all groups

If multiple groups are present, they will first appear as tiles when the app is launched.

Groups with suboptimal air quality are highlighted. At a glance, it is clear which mode they are in and how intensively they are running.

After clicking on one of the groups, the page for that group will open.

The App

Group display – Page 1

On page 1, the trends of the past hours are displayed. The top edge of the colored area shows the CO_2 concentration.
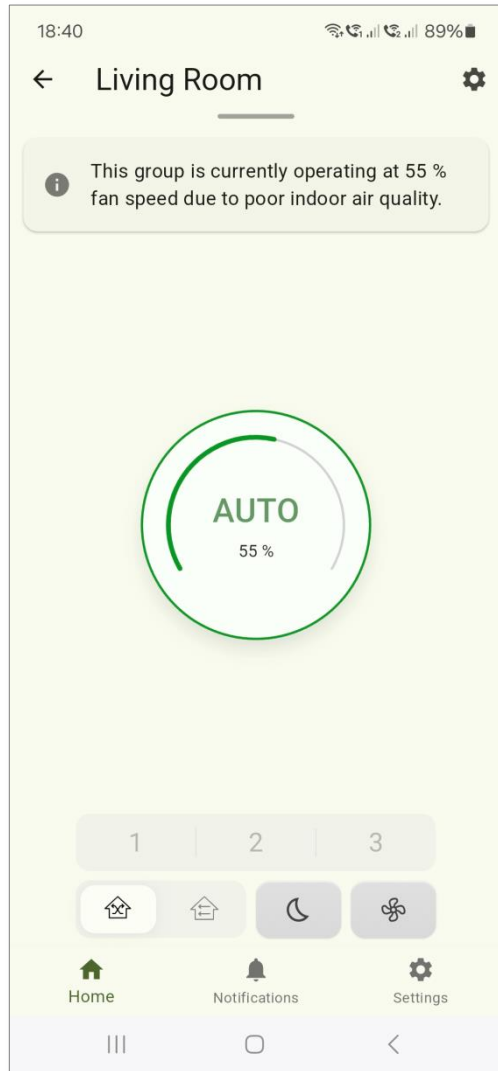
The black line represents the TVOC concentration.

Below that is the comfort diagram showing the current situation and the conditions of the past hours.

By scrolling, you reach page 2 — the group control.

The App

Group display – Page 2

In the center are the controls for managing the group. The circle in the middle switches the mode.
Possible modes are: AUTO / ON / OFF, where ON corresponds to manual mode. Then, the ventilation intensity can be adjusted using the buttons 1/2/3 or the circle.

Below are additional elements for manual control.
Manual switching between summer mode and heat recovery, sleep mode, or time-limited intensive ventilation.

The App

App settings (general)

At the app level, the following settings are made:

- Language
- Connection to the gateway
- Connection to the ventilation devices and creation of groups
- Specification of coordinates

The App

Group settings

At the level of each group, the following settings are made:

- Control profile (Fresh / Normal / Silent)
- Weighting of CO_2 / TVOC
- Calibration of the CO_2 sensor
- Setting the threshold for dehumidification
- Programming the sleep mode
- Filter management
- Intensity of the LED display
- Possibly performing an update