



VILPE® Sense

a smart system for moisture control



VILPE Sense is a smart system to prevent moisture damage



Sense is the first product on the market for both detecting and preventing moisture damage.



The solution consists of VILPE's roof fan with an EC motor, combined with a control unit, a mobile base station, and two or more sensors.



Intended use

VILPE Sense measures the relative humidity and temperature of a building's structures (for example, roof structures or base floors), which allows possible damage or leakage to be detected as soon as it occurs. The faster hidden damage is detected, the easier and cheaper it will be to repair.

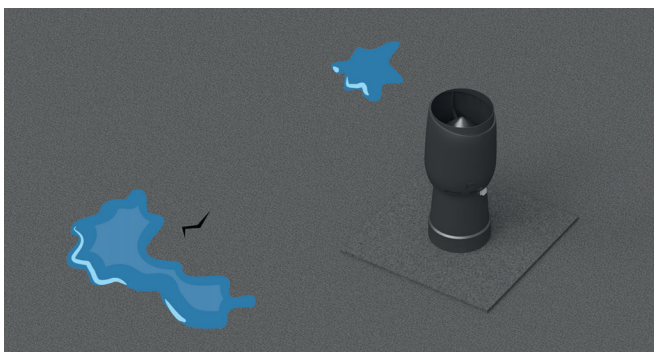
In addition, the system reacts to increases in humidity by increasing the ventilation in structures or insulation layers. When moisture is quickly removed from structures, additional damage is avoided.

Benefits

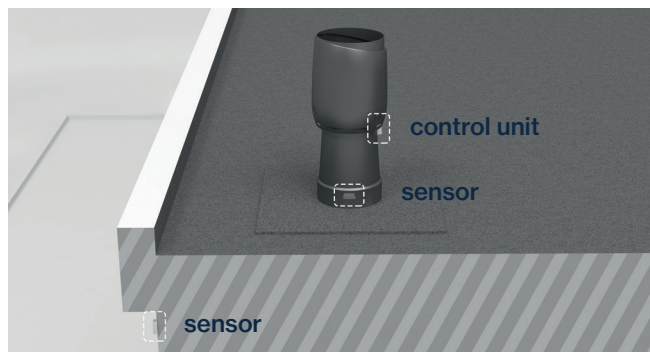
The humidity management system of structures is part of responsible construction and property maintenance. The Sense system benefits property owners, housing company decision-makers, and renovation companies. The system enables accurate and systematic monitoring of the condition of roof structures and base floors, as well as better drying of structures.

- When problems are detected in time, the need for unanticipated and costly renovations is reduced or even eliminated.
- Repairs can be directed immediately to the right place, so they are cheaper and faster to implement.
- Repair needs are easy to assess in advance and repairs can be carried out systematically.
- Studies or repairs of structures do not need to be conducted on the basis of guesswork alone – objective, measurable data is available to support decision-making.
- Insulation layers and structures are automatically ventilated, for example, after rain or during humid autumn conditions. Keeping the insulation layer and structures as dry as possible significantly prevents the formation of mould or fungi in the structures.
- Better insulation layer performance. Moisture in the insulation layer significantly reduces its insulation capacities, which increases energy consumption in the building.
- Prevents moisture damage even during construction, when structures are exposed to varying weather conditions.
- Increases the resale value of the property. For sales purposes, the condition of the property can be proved with reliable data. The need for difficult roof structure inspections can also be reduced.

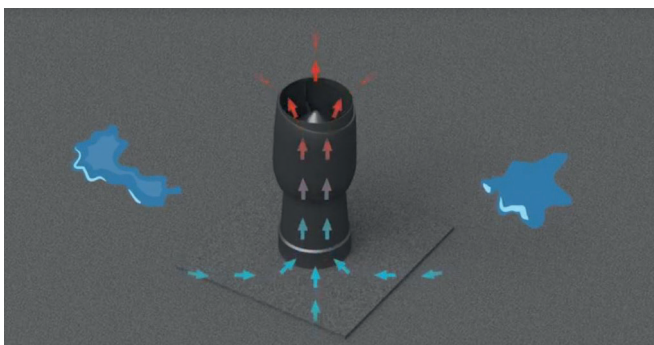
Functioning of the system



1. In one scenario, there is minor damage on the roof, from which rainwater can leak into the structures. The leak is so small that it is not detected.



2. The negative pressure air vent on the roof structure is fitted with a VILPE ECo roof fan, a control unit, a mobile base station with a SIM card, and two sensors that measure air temperature and relative humidity. One sensor is installed on the roof in the open air and another in the structures of the roof.



3. The sensor detects an increase in humidity levels in the structures, and the data is transmitted by wireless sensors to the control unit that adjusts the roof fan, then to the mobile base station for upload to the cloud.

The roof fan adjusts to the optimal level to remove excess moisture from the structures. When excess humidity has been removed, the roof fan returns to the normal level.



4. Sensor data is stored in the cloud for the user to access. Based on the cloud data, it can be concluded that there may be a leak in the roof.

When the damage is detected and repaired in time, extensive and costly repairs that would otherwise have to be carried out are avoided.

Quick and easy start with the preinstalled SIM card

The VILPE Sense system can be purchased with a preinstalled SIM card with a data service subscription. This makes it easy to start using the system. The SIM card operator is Elisa M2M (Vodafone Global) and it works in EU and ETA countries.

The guarantee for the subscription is 10 years.

A SIM card is required for the function of the VILPE Sense mobile base station and needs to be purchased separately if choosing the Sense mobile base station with no included SIM card.

Insurance claims uncertain for roof and roof structure repairs

In a study carried out by research firm Kantar TNS, interviews were conducted with decision-makers and experts responsible for monitoring the condition of the roofs and possible renovation projects.

Based on the study, roof repair projects that are carried out before the end of the roof's life time are common. Risk factors, especially on flat roofs, included inadequate ventilation of substructures, lack of maintenance, ageing of roofing and opening of seams. Forecasting and regular maintenance extended the life time of the roof.

Many of the interviewees also highlighted the fact that obtaining full compensation from insurance companies for roof and roof structure repairs was considered uncertain.

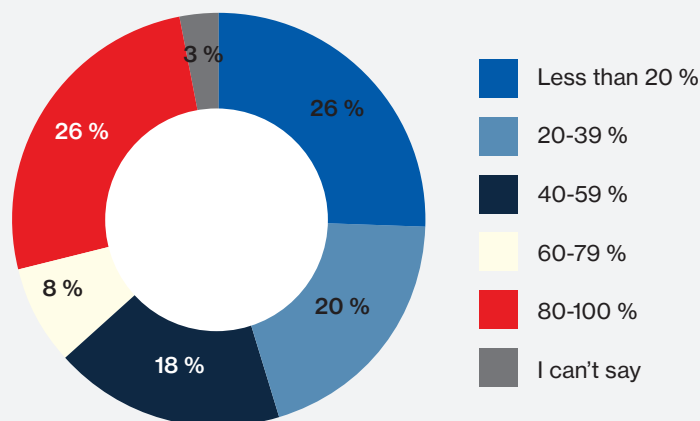
The interviews were conducted in May 2020.

Frequency of roof repairs

What is your view of the prevalence of roof renovations of apartment blocks, commercial buildings and public buildings (before the end of their lifetime)?

How many buildings are subject to roof repairs before the actual end of the roof lifetime?

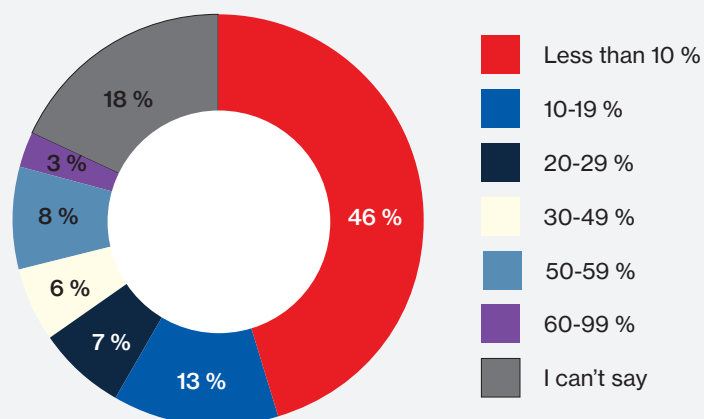
” One in four reports that 80–100 % of roofs are subject to roof repairs before the end of their life time. ”



Insurance company compensation policies

According to your estimate, how much of the total number of roof and roof structure repairs carried out before the end of their lifetime will be reimbursed by insurance companies?

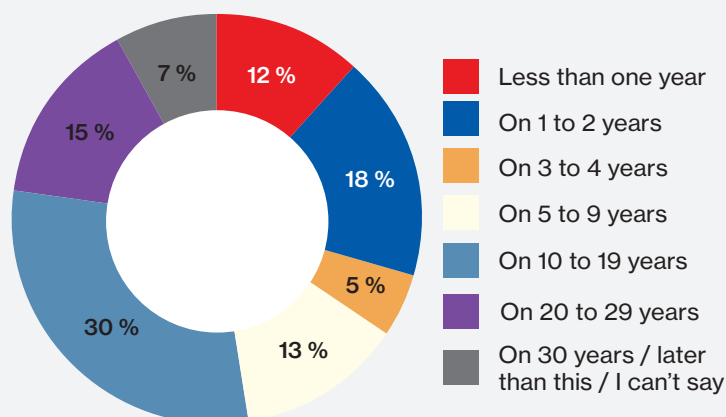
” Nearly half of the interviewees estimate that less than 10 % of repairs will be reimbursed by insurance companies. ”



Incidence of first problems

As you see it, how soon after the buildings are commissioned do the first roof/roof structure problems typically arise?

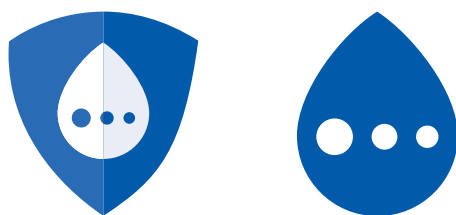
” According to the interviewees, 30% of the problems arise in less than three years after the commissioning of the building. ”



Thanks to VILPE Sense, the fault was detected and repaired

VILPE Sense was used in the buildings of a public institution. The system was installed in three different buildings, making it easier to compare data. The comparison showed that the absolute humidity of one building in rainy weather was higher than in the other two buildings.

This suggested that there was a fault in the roof structures, which caused moisture to enter the structures. The leak was located and repaired. After the renovation, the absolute humidity of this building also remained at the same level as the other buildings.



“Thanks to Sense, the structures have remained drier”

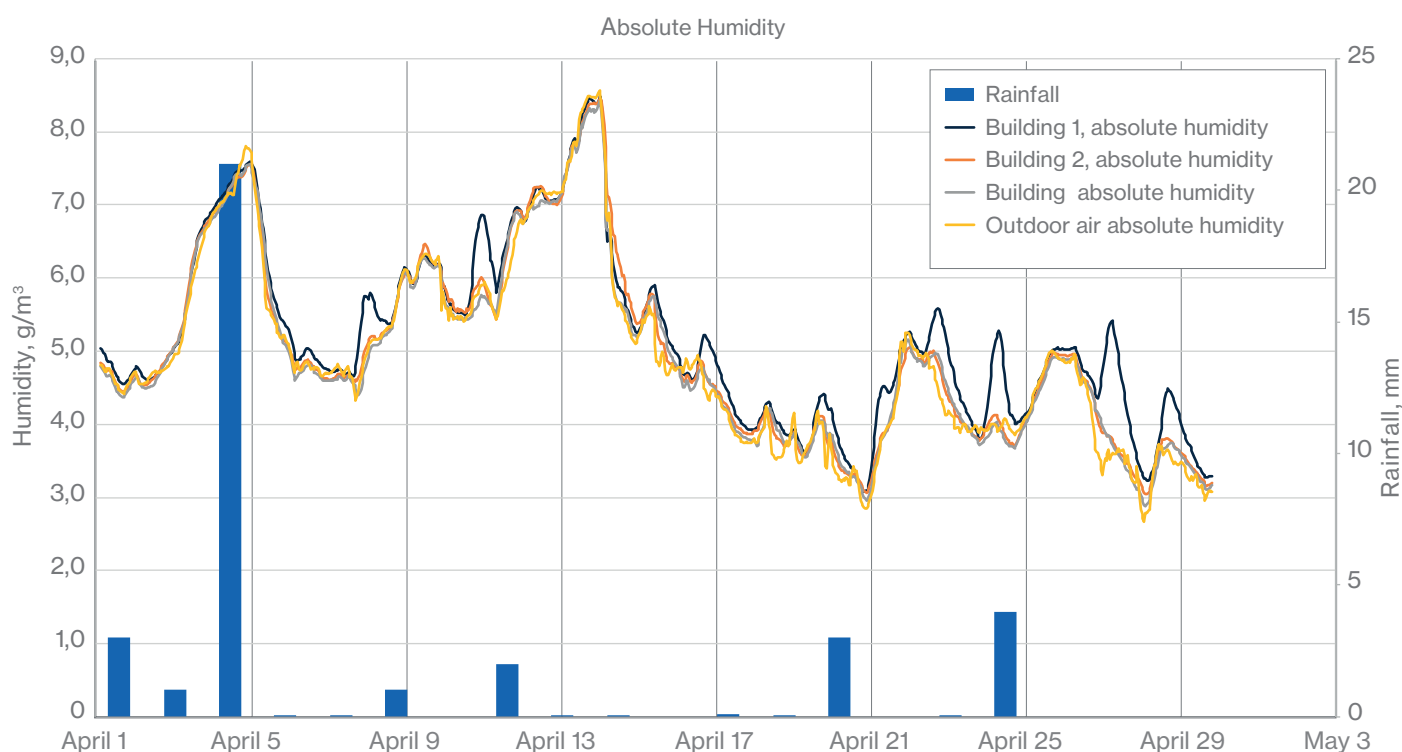
VILPE's head office and factory in Mustasaari was a natural place to install the VILPE Sense system. A roof fan, control unit and two sensors were installed on the flat roof. In the first year, Product Manager Janne Vedenjuoksu became convinced that the system would work.

“The system works as it should. Thanks to the system, the humidity level of the structures is low compared to the outdoor air”, says Vedenjuoksu.

The larger the roof area, the more difficult it is to detect hidden problems with the ventilation of structures. The system considerably improved the ventilation of the structures.

“It is important for us to know that the roof structures will remain in good condition now and in the future. The system enhances the existing negative pressure ventilation. Even though no problems were detected on the roof of the factory, Sense makes us feel confident about the condition of the roof.”

Comparison of humidity levels after rain in three buildings



The graph shows how the absolute humidity of building 1 is higher after rain compared to buildings 2 and 3. It was concluded that there may have been a leak in the roof structures of building 1.

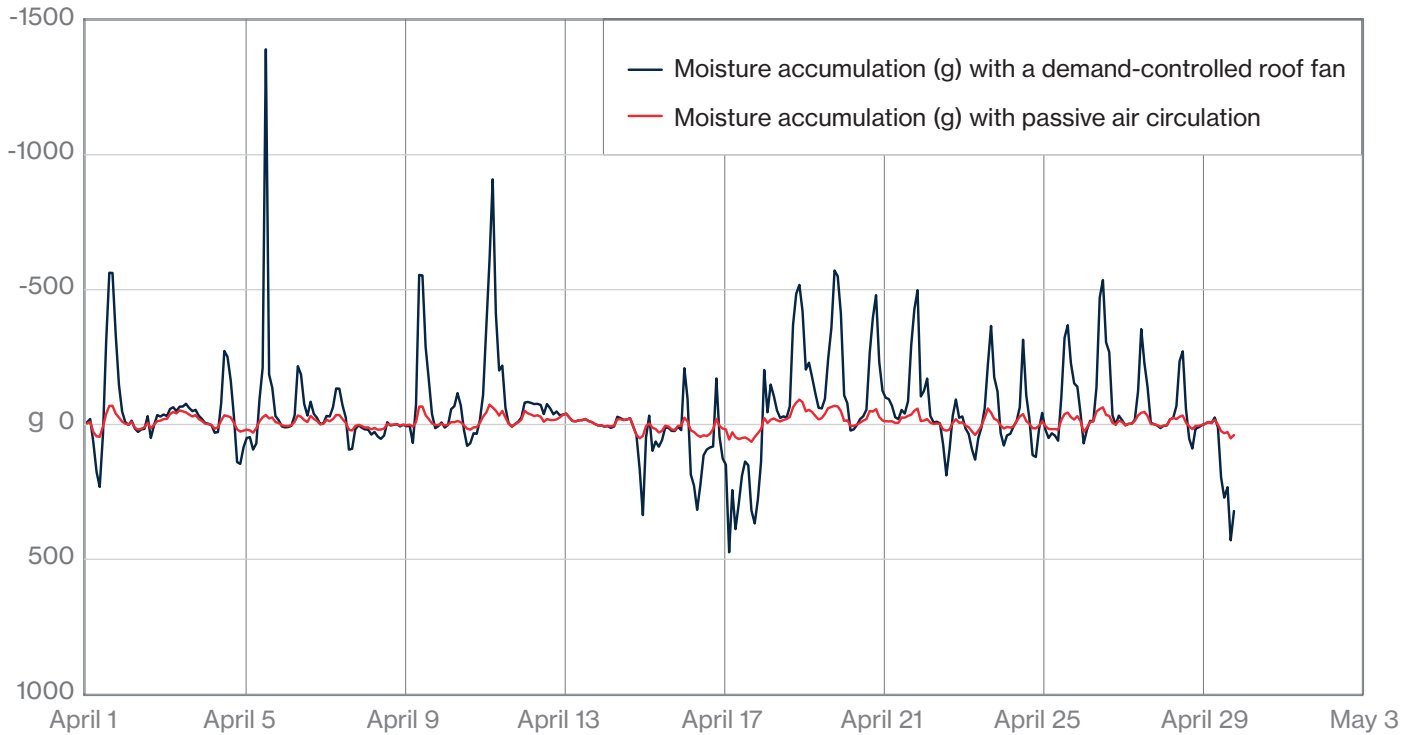
The graphs also take into account the humidity that enters the building with the ventilation air.

Note: These tables were made by VILPE and are based on data from the Sense system and rainfall statistics.

The Sense system removes moisture more efficiently than passive air circulation

Removed humidity, daily differences (g)

Moisture accumulation shows how much moisture has entered or has been removed from the building.

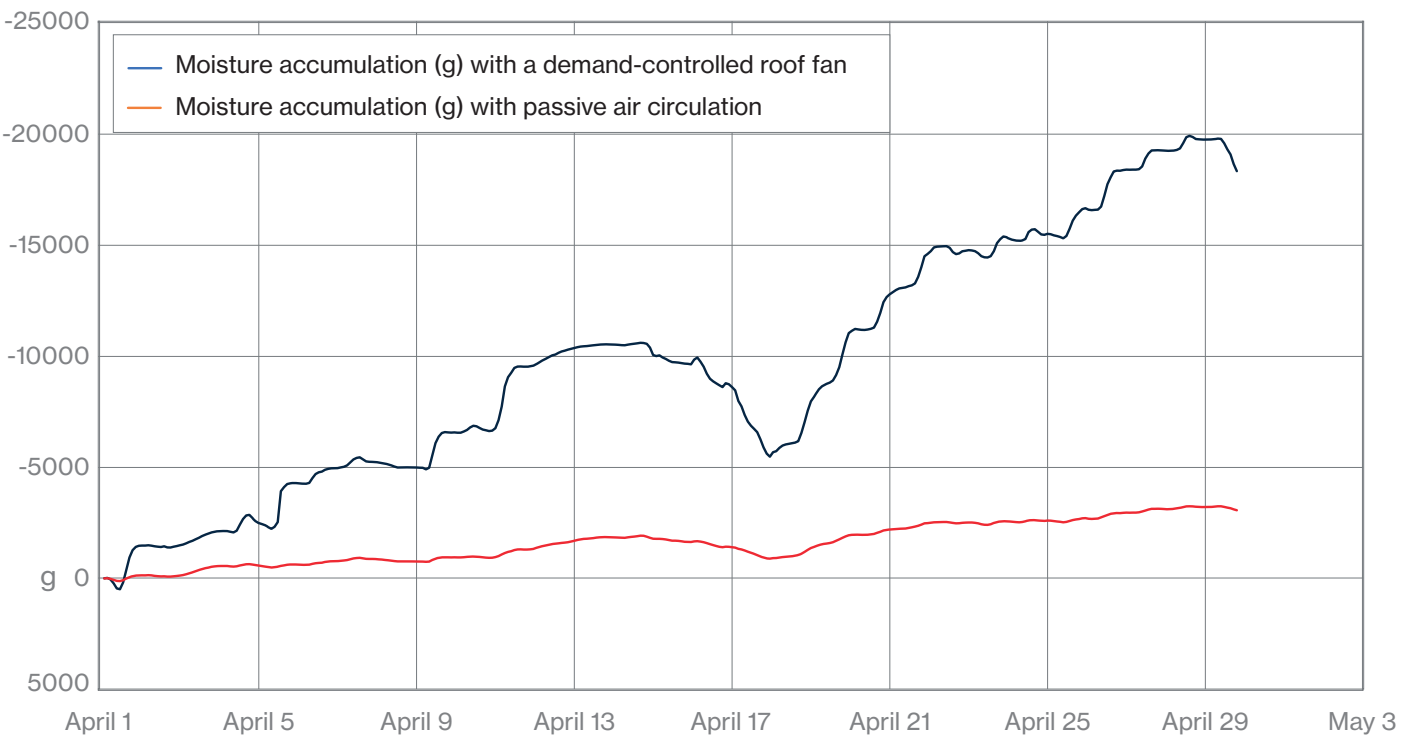


Daily removed humidity for one month. The Sense system removes more moisture (18 335 g = about 18 litres) than passive air circulation (3 075 g = about 3 litres).

The graphs on the page also take into account the humidity that enters the building with the ventilation air. Please note the results may vary in different buildings and conditions.

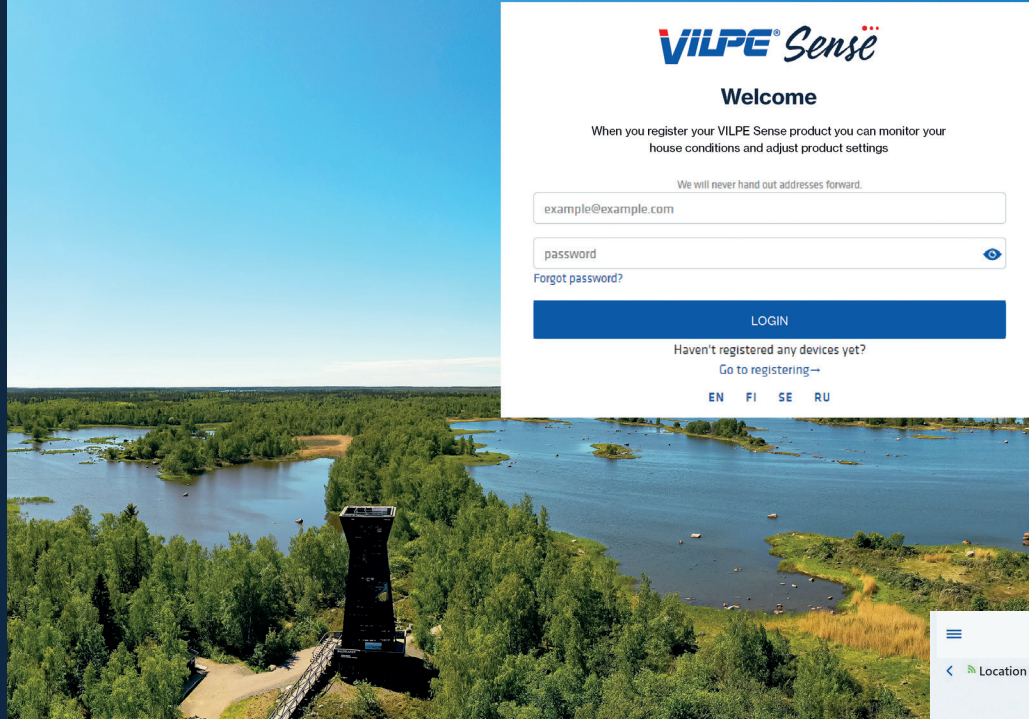
Total humidity removed per month (g)

Moisture accumulation tells how much moisture has entered or has been removed from the building.



Total moisture accumulation over one month (the previous day's number is added or subtracted from the next day's number).

The Sense system removes more moisture (18 335 g = about 18 litres) than passive air circulation (3 075 g = about 3 litres).



User interface

VILPE Sense provides valuable data on the humidity level of structures. Sensor data is stored in the cloud service, where users can see the temperature, relative humidity, absolute humidity, mould index and roof fan motor speed.

Data can be tracked for one or more areas. The main user can also easily share a link to the data, so that residents of an apartment building or users of public buildings, for example, can see the humidity level of the structures. The user interface works on both PC, phone and tablet.

The VILPE Sense system operates by safely and securely transferring data from its sensors to the cloud via a wireless control unit, which forwards the data to a separate mobile base station for upload. Information is thus transmitted safely and securely.



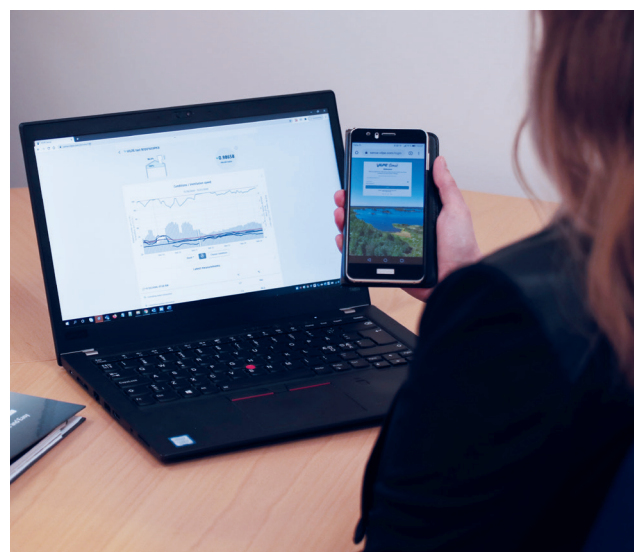
What affects the accumulation of moisture in structures?

VILPE, in partnership with Metropolia University of Applied Sciences, investigated how outdoor air temperature and humidity affect the humidity load of structures. The study was carried out in a test room, where different weather conditions were simulated by altering the temperature and humidity level.

The study showed that there is a need for a humidity control system for structures, especially in the varying weather conditions. Negative pressure air circulation alone is not enough.

Moisture accumulation is affected by:

1. Cold weather. Considerably more moisture accumulates in structures if the insulation layer cools down.
2. Air leaks. It is very important to block air leakage from the building. This ensures that warm and humid air does not end up in the insulation layer and increase its humidity.
3. Distances between air intake and exhaust ventilation cavities or grooves. The longer the distance is, the easier it is for moisture to accumulate in the insulation layer or insulation materials.



Frequently asked questions

Why choose VILPE Sense instead of passive underpressure ventilation?

VILPE Sense improves passive, underpressure air circulation in structures. It gives alerts of the increased humidity of the structures and dries them. The system can be used to improve, regulate and monitor the ventilation of structures. The collected data also makes it possible to detect hidden roof leaks.

If the roof of the building is waterproof, is there any benefit in using the Sense system?

The Sense system is more than a roof leak alarm system – it is designed to remove moisture from structures. Humidity builds up in structures due to temperature and humidity fluctuations, and the Sense system detects this moisture and removes it.

Based on the data from the system, it is also possible to detect leaks by observing how quickly moisture is removed from the structures. The ideal comparison situation is if there are several Sense systems on one roof, Sense is installed in adjacent buildings, or there are several sensors on the same property.

What is a roof fan needed for?

A roof fan is needed to keep insulation layer/structures dry. The drier the insulation, the better the insulation performance. Dry structures prevent the emergence of mould and fungi. This also extends the lifespan of the structures themselves.

How much electricity does the roof fan consume? Is Sense energy-efficient?

The Sense control unit is installed in an energy-efficient VILPE EC roof fan. The control unit adjusts the operation of the roof fan as needed, so the roof fan does not consume excess energy. The fan mainly operates at a moderate speed. Its average power consumption is 5 to 10 W, which is the same amount consumed by a modern LED lamp.

How does the roof fan get replacement air to operate?

The Sense system requires enough replacement air to operate properly. This also prevents it from taking replacement air through the structures. Sufficient amount of replacement air for the ventilation system should be ensured with structural solutions. Supply of the replacement air can be arranged e.g. with underpressure vents.

How does the air circulate in the system, and how does the fan affect this?

The VILPE Sense system does not stop the natural circulation of the air but rather improves it. When the roof fan is running at the lowest speed, the air circulation corresponds to the underpressure circulation. As humidity levels in the ventilated structures rise, the roof fan speed increases. The roof fan is always on, unless the temperature is -7 °C or colder. At that temperature, the roof fan turns off in order not to excessively cool the structures.

How does the control unit analyse how to adjust the roof fan? How can this be done without manual input?

The VILPE Sense system is demand controlled by the control unit based on an intelligent algorithm. The adjustments are influenced by outdoor air temperature and relative humidity. The roof fan is set to certain limit values that must not be exceeded or reduced. For example, air circulation is limited in freezing temperatures.

The algorithm controls the operation of the roof fan so that the structures remain in good condition. It is programmed to keep the ventilated area as dry as possible. The aim is to bring dry air to the structures and extract humid air.

How does the roof fan adjust in practice?

For example, during rainy weather, the humidity level of the outdoor air is high and fan rotation is kept to a minimum to not replace the relatively drier air in the ventilation area with the more humid air from outside. When the rain ceases and the air is drier, the rotational speed increases. The demand controlled nature of

the system maintains the optimal ventilation of structures, as the roof fan is used to remove on average six times more moisture from the structures than conventional solutions.

In which countries does the preinstalled SIM card work?

Netherlands, Belgium, Bulgaria, Spain, Ireland, Iceland, Italy, Austria, Greece, Croatia, Cyprus, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Norway, Portugal (included Madeira and the Azores), Poland, France, Romania, Sweden, Germany, Slovakia, Slovenia, Denmark, Czech Republic, Hungary, The Vatican, Estonia and French Guyana, Guadeloupe, Martinique, Mayotte and Reunion.

What is the lifetime of the VILPE Sense system?

The system itself will remain in good working order for decades. The lifetime of the sensors, on the other hand, is 10 to 15 years. The sensors will operate until the battery is drained after which the sensor will need to be replaced.

Will the sensor issue an alert if it breaks?

If the sensor breaks or the battery runs out of power, this will be indicated in the Sense user interface. When the sensor is working, it is indicated in green in the interface. By contrast, grey indicates that a fault has occurred in the sensor and/or it has become unresponsive.

How do I scale the system? How large of an area does one roof fan cover?

One roof fan covers an area of 200 m². However, this depends heavily on the structure, construction, type of ventilation and number of other factors. Always consult structural ventilation professionals before installing the system.

How wide an area do the Sense's sensors cover?

One sensor in the ventilated area is enough to monitor the area covered by one roof fan.

How is the system controlled if there are multiple sensors?

At least two sensors are required to control the roof fan: one outside and one in the structures (target area). The control unit adjusts the roof fan using the data from the two sensors, and the mobile base station then uploads the data directly to the cloud. Several sensors can be installed in the ventilated area if data is to be collected more widely or more accurately. If the ventilated area has more than one sensor, any one of them can be selected to feed the control unit. Additionally, more control units can be installed with sensors linked to them – for example, on other buildings nearby – and connected to the same mobile base station.

How fast does the system work after installation?

The system starts working immediately after being connected. However, it will take approximately 7 hours to charge the internal capacitors in the transmitter that feeds the data to the mobile base station and user interface.

In practice you will be able to tell that the system is working and properly connected as the fan will start running immediately, but it will take the above-mentioned time before you can see the data in the user interface.

How long is the warranty for the system?

The system has a two-year warranty.

What if the building owner changes?

The admin user can delete the admin rights from the device settings. This enables a new admin registration. The new admin user has to have a personal user account.

If the old admin user is unknown, it is possible to request the admin user to free the device and its admin rights using the control unit serial number. This request is sent to the old admin user by email.

In situations where the old admin user does not react to the email request, please contact VILPE customer service which is able to free the old user rights for new registration.

Alipai and Sense are a perfect match on the roof

VILPE's Alipai products have been used for roof structure ventilation for decades and they are an essential part of effective roof structure ventilation.

The Sense system takes this passive underpressure ventilation system to a new level as it combines the Alipai products with a smart, IoT-based control system.



VILPE

VILPE products bring better indoor air, improved energy efficiency and prolonged lifetimes to buildings. The products are manufactured by a Finnish family business, VILPE, which is the leading manufacturer and developer of ventilation and special roofing products in Finland, the Baltics, Russia and Scandinavia.

VILPE's operations are based on customer-oriented and innovative product development. The products are of excellent quality, and they have long warranties. The management system of VILPE Oy has been granted both the ISO 9001:2015 quality certificate and the ISO 14001:2015 environmental certificate.

VILPE is a symbol for safe building and living.

NAME	PRODUCT NO.
VILPE Sense basic kit mob.	735042
VILPE Sense sensor (extra)	735041
VILPE Sense mobile base station + SIM	735043
VILPE Sense mobile base station	735044
VILPE ECo Sense roof fan	741982

