

CASE STORY

# AIRMIX AND CONTROL SYSTEM: A GOLDEN COMBINATION FOR AN OPTIMUM CLIMATE

To achieve optimum performance of the Airmix ventilation/circulation system, good control is essential. A variety of climate computers and control systems are available on the market. Hoogendoorn Growth Management, Priva and Ridder are all manufacturers with experience of controlling the Airmix, and they know exactly what is needed to maximise the system's benefits. Their products all work in a unique way, but their goal is the same: to achieve optimum performance of the Airmix so that it satisfies the grower's requirements.



The Airmix allows active ventilation with a closed screen by blowing air from above the screen into the greenhouse below the screen. The purpose of this active ventilation is different in each greenhouse. In some situations the greenhouse temperature needs to be reduced, while in others the aim is to remove moisture so that evaporation is maintained. Both of these are possible because the temperature and absolute humidity of the air above the screen are generally lower than below the screen.

## AUTOMATION

We recommend that a modern climate computer is used to control the Airmix. These computers have software that actively initiates ventilation and circulation on the basis of temperature and humidity in the greenhouse. The data used for this come from sensors in the greenhouse, located both above and below the screen and within the crop, and from the weather station mast outside; ideally, the weather station should be able to measure humidity as well as temperature.

A variety of control systems are available on the market, and each of them works in a unique way. Hoogendoorn, Priva and Ridder all have experience with controlling the Airmix via their climate computer, and here they share their experiences with the Active Air (in both iSii and IIVO), Connex and MultiMa respectively.

## DIFFERENT CONTROL SYSTEMS

Control of the Airmix using Hoogendoorn's 'Active Air' function is flexible and can anticipate changing climate conditions. Paul de Koning, a consultant at Hoogendoorn, says: "The way it's used can be adjusted to meet the needs of every grower. It's important to know what a grower wants to achieve in terms of production and quality of the crop. The Airmix is controlled on the basis of the Psychro diagram of LetsGrow.com, which gives an overview of the target values."



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**Paul de Koning,**  
Consultant at Hoogendoorn



The **Active Air** can be used for control based on both temperature and humidity. Personal supervision ensures that the system is used in a way that meets the needs of every grower.

The Priva Connex climate computer ensures that the variables affecting growth are controlled and monitored to create the right climate for the crop. René Hofman, a product line owner at Priva, explains: “The Connex makes sure that the Airmix is used effectively on the basis of highly precise measurements. The climate computer decides when it’s really necessary to actively ventilate the greenhouse with air from above the screen (or from outside). This means that the screen can stay closed for longer, while the temperature is kept under control and moisture can be extracted. The Connex also smoothly switches the Airmix from standard recirculation to cooling or dehumidification with a closed screen.”

“A customer who uses the Connex can choose to control the Airmix on the basis of the Mollier diagram, so that it’s used effectively. The system will then be used as (part of) a complete air treatment system. The customer can additionally choose the new module developed in consultation with Peter van Weel and Airmix users. The most important factors in this add-on to the recirculation software are enthalpy and absolute moisture difference. Ultimately, the point is that we work with the customer to find the right solution for his own situation and his own requirements.”



The climate computer decides when it’s really necessary to actively ventilate the greenhouse with air from above the screen (or from outside).

**René Hofman,**  
Productline Owner at Priva

**PRIVA**

With the **Priva Connex** climate computer, the variables that influence the growth are controlled and monitored to create the right climate for the crop. The Connex makes sure that the Airmix is used effectively on the basis of highly precise measurements.



Joost Veenman, a process automation product manager at Ridder, explains their control system: “Ridder’s MultiMa climate computer offers the option of directly connecting the Airmix, with its EC fans, via a so-called ‘modbus’ connection. This connection allows the Airmix’s speed to be adjusted directly on the basis of the desired and measured values in the greenhouse. The correct speed is therefore controlled automatically and no energy is wasted on unnecessary ventilation. This gives excellent insight into how much electrical power is used and hence the consumption. It’s also easy to establish whether each fan is working properly or needs servicing. The direct connection results in smooth, precise control of the valves and fans, to ensure their optimum operation. The extensive options of the Ridder MultiMa computer’s MyInfluences setting charts provide growers with many possibilities for creating the strategies and influences that they personally want for the use of the Airmix.”



This connection allows the Airmix’s speed to be adjusted directly on the basis of the desired and measured values in the greenhouse.

**Joost Veenman,**  
Productmanager process automation at Ridder



The 'modbus' connection of the **MultiMa** climate computer allows the Airmix's speed to be adjusted directly on the basis of the desired and measured values in the greenhouse. The direct connection results in smooth, precise control of the valves and fans, to ensure their optimum operation.

## CONTROL BASED ON TEMPERATURE AND HUMIDITY

Control takes place on the basis of temperature and/or humidity, depending on the grower's requirements, the growing conditions and any other conditions. Hoogendoorn has a variety of control systems that can be used. De Koning (Hoogendoorn): "To regulate the greenhouse temperature under a closed screen, the Airmix blows cooler air (inside or outside air) from above the screen to below it. The greenhouse temperature at which this process will start is set by the grower with the Active Air ventilation temperature. The climate computer calculates the required position of the outside air valve on the basis of the actual greenhouse temperature and outside conditions. To regulate the humidity in a greenhouse, the Airmix blows drier air (inside or outside air) to below the screen. Based on the air that's blown in, the climate computer calculates the actually achieved dehumidification capacity. The computer adjusts the position of the Airmix's outside air valve to the Active Air dehumidification capacity required by the grower. If the achieved capacity is lower, the computer opens the outside air valve more. If the absolute humidity above the screen needs to decrease, the vent opening increases further."

A big advantage of the Airmix in combination with the Priva Connex is the simplicity and effectiveness of this method of active ventilation with a closed screen. "Using the cold and drier air that's already present above the screen makes it unnecessary to invest in complicated air treatment systems," says Hofman (Priva). "When you control the Airmix with an intelligent controller like Connex, you can achieve precise control based on temperature and moisture level."

Veenman (Ridder) further explains that maximum optimisation of the growing climate can be attained with the right combination of hardware and software. "Our climate computers can control the Airmix on the basis of temperature and humidity in the greenhouse. Unlike with normal recirculation, the measurements are an important factor for control with the Airmix. It's therefore advisable to choose reliable measurements and to think carefully about where to place the sensors. This can be a serious pitfall: not all sensor units are well-positioned to give a representative picture for the control. It's therefore important to link the right measurement. We use adjustable weightings of multiple sensor units to obtain a good average value that can be used for control."

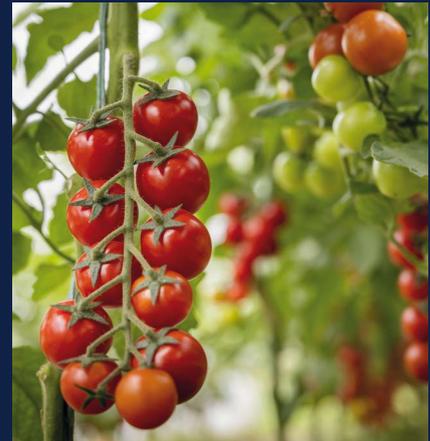


## PRECISE MEASUREMENT

Veenman (Ridder) recommends the use of electronic sensor units. “They’re preferable because of their lower servicing frequency. As well as the usual sensors and sensor units for measuring temperature and humidity in the greenhouse, you also need to measure the outlet side out of the Airmix. And it’s good to have measurements above the screen inside and outside (weather station). The measurement above the screen gives insight into the mix ratio. The temperature measured in the greenhouse and the absolute humidity of the air that’s blown in are indications of how effectively the Airmix is operating.”



The control can be based on both temperature and humidity. The grower’s requirements form the basis for cooling or dehumidification with a closed screen, in order to achieve the desired situation.



## THE GROWER'S REQUIREMENTS

The basic principle of all the control systems is that their use will meet the needs of every grower. It is important to know what a grower wants to achieve in terms of production and quality of the crop. The experiences with the Airmix show that every situation in every greenhouse is different. De Koning (Hoogendoorn): "This is why we provide personal supervision of its use, so that Hoogendoorn can meet the specific requirements of the growers and take account of the characteristics of crops and systems." However, the outside conditions influence the Airmix's ultimate cooling and dehumidification capacity. Hofman (Priva) adds: "The Priva Connex takes these directly into account in the control of the Airmix. The grower doesn't have to worry about them at all!"

## CONCLUSION

Hoogendoorn, Priva and Ridder all have a control system that can be used to control the Airmix. This is done on the basis of precise measurements within the greenhouse and outside via the weather station mast. The control can be based on both temperature and humidity. The grower's requirements form the basis for cooling or dehumidification with a closed screen, in order to achieve the desired situation.

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