



**Eurovent 16/4 - 2024**

## **Classification and correct positioning of an air curtain unit**

**First Edition**

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## Document history

This Eurovent Industry Recommendation / Code of Good Practice supersedes all of its previous editions, which automatically become obsolete with the publication of this document.

## Modifications

This Eurovent publication was modified as against previous editions in the following manner:

Modifications as against	Key changes
1 <sup>st</sup> edition	Present document

## Preface

### In a nutshell

**The present document provides the common classification of air curtain units and guidance and best practice for their correct positioning. Particularly, this recommendation focuses on:**

- **Application of air curtain units**
- **Commercial and industrial air curtain units**
- **Special air curtain units**
- **Properties of air curtain units**
- **Correct application to revolving doors or entrance lobbies**

## Authors

This document was published by Eurovent and was prepared in a joint effort by participants of the Product Group 'Air Curtains and Fan Heaters' (PG-CUR), which represents a vast majority of all manufacturers of these products active on the EMEA market.

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## Suggested citation

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## Important remarks

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## Classification of air curtain units

This chapter will provide a short introduction on how air curtain units are classified today on the market and critical differences that differentiate what makes one air curtain unit better suited to an installation than others.

**What is important to notice is that air curtain units always provide energy savings, whether this is the most commonly found effect of temperature control or other applications, such as humidity control where ice formation and accumulation can be minimised, reducing operational costs.**

Air curtain units can be classified by:

- Application
- Place of installation
- Properties
- Heating type

A particular mention is for “design air curtain units”, a variant of air curtain units that are designed to be visually striking. They are typically designed and/or customised in collaboration with architects or designers and constructed with a nice-shaped casing. Usually made of premium materials (brushed or polished stainless steel, aluminium, copper etc.), these products are designed for installation where an air curtain unit has a significant aesthetic impact on the area and so a more fashionable style is required (like museums, galleries etc.) to meet the customer’s specifics.

### Classification by application

Application	Aim	Properties
Climate separation (most commonly used)	Energy savings and comfort of people	The air jet speed and/or thickness is directly related to the temperature difference and opening height. The higher the temperature difference (or the higher the opening) is the higher the speed or thickness (or both) should be. The pressure difference between inside and outside shall be minimised for the optimal functioning of the air curtain unit. Building design (stack effect), ventilation system and/or geography should be considered.
Cold Storage (humidity, moisture, ice on floor...)	Safety and climate separation with humidity control, preserve perishable goods	Several factors influence the effectiveness and efficiency of air curtain units used for these applications. These factors include air jet speed, thickness, the use of multiple jets, and air recirculation. The optimal settings for these factors depend on the temperature and humidity difference between the conditioned space and the surrounding environment. A larger temperature difference and opening dimension typically requires a higher air jet speed, increased thickness, or potentially both.
Insect entrance prevention	Reduce insects entering the building	The most important feature is the air speed along the whole projection. Recommendations: automatic functioning according to door contact, installation outside, etc.
Sanitary and odour protection	Reducing the pollution entrance from the outside.	Recommended installation: the most important aspect to consider is that the installation must be in the clean zone inside the building, the building must be over-pressurised
Clean production separation	Prevent the transfer of pollution inside the production area	Recommended installation: the most important aspect to consider is that the installation must be in the clean zone, the building must be over-pressurised

The above applications can be combined together, in this case, the supervision of an expert designer is recommended.

### Classification by place of installation

Place of installation	Category	Recommendations
Shops, malls, restaurants, hotels, banks, supermarkets, hospitals, colleges/universities, government, airports	Commercial/Leisure	Please refer to the below in-depth paragraph
Production plants, distribution centres, warehouses...	Industrial	Recommended installation: vertical or horizontal depending on the dimension of the opening. In the case of vertical installations, where the air stream does not fully cover the opening, the recommended installation is on both sides of the door opening (left and right). For all the special applications, consultation with an expert designer or the air curtain unit manufacturer is recommended.

### Comfort and commercial air curtain units

Commercial air curtain units, also known as comfort air curtain units, offer not only energy savings from climate separation but can provide cooling in Summer (Figure 1) or heating in Winter (Figure 2) for those near the air curtain unit to help improve thermal comfort.

Their main purpose is to deliver energy savings by creating climate separation between two areas, whether it's inside or outside, or two internal spaces, by creating an air barrier that gives a significant reduction of the heat transfer through the opening. This increases building energy savings whilst also reducing physical barriers to entry for customers. For these reasons, they are preferred by high street retailers (Shops & Stores), public buildings, shopping malls, banks & office buildings, hotels etc. where people should be encouraged to enter through the doorway.

The air curtain unit does not replace a door, the best solution is always an automatic closing door coupled with an air curtain unit for energy saving when the door is open.

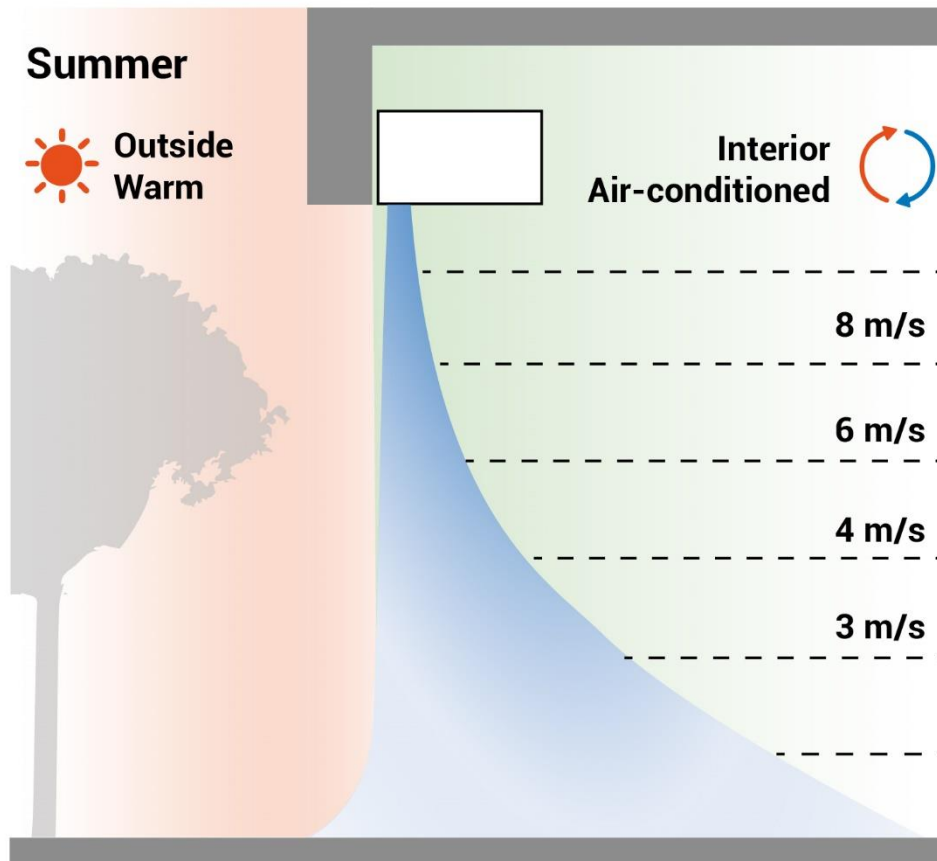


Figure 1: correct functioning of a comfort air curtain unit - summer season

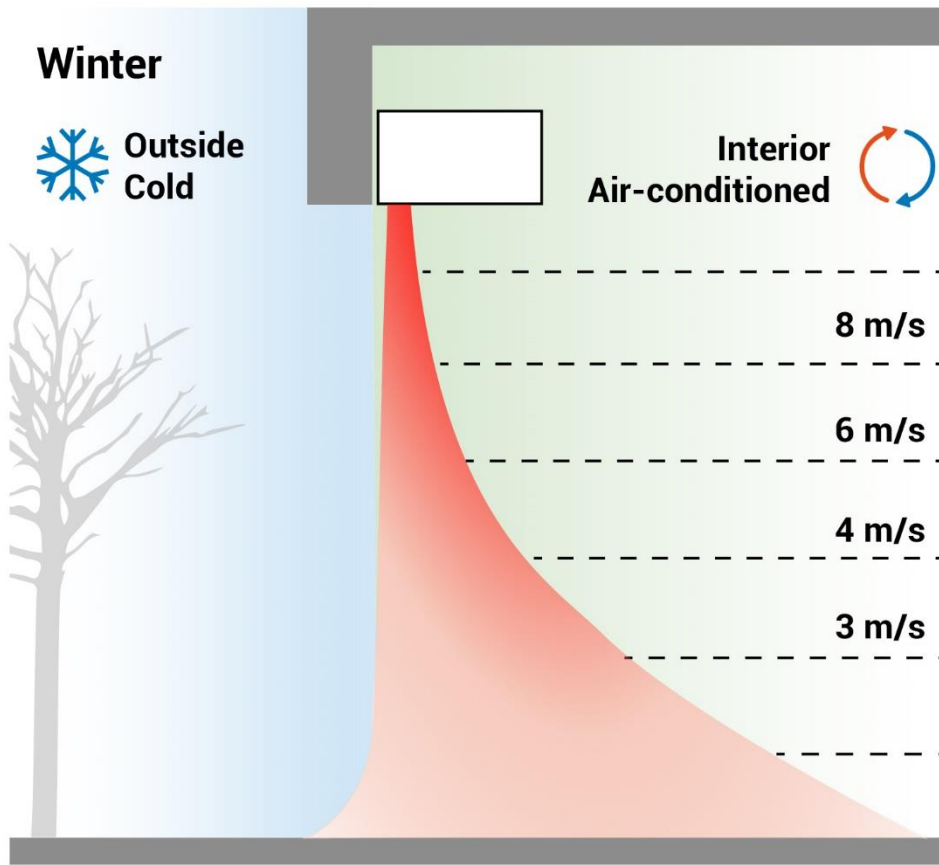


Figure 2: correct functioning of a comfort air curtain unit - winter season

Practical air volume flows are between approximately 1.200 m<sup>3</sup>/h and 4.000 m<sup>3</sup>/h per air curtain unit meter. The smallest air quantities apply to a low installation height with a small temperature difference between inside and outside with low levels of prevailing wind, while the largest air volume flows apply to a higher installation height and a large temperature difference between inside and outside with higher levels of prevailing wind.



### Industrial air curtain units

These units get their name as the air curtain units used in the large opening of industrial buildings related to production and/or transportation processes. Their main purpose is to protect the internal (working environment) from external conditions to maintain comfort for staff and reduce the ingress of dirt and other particulates. The barrier created by the air curtain unit allows a significant reduction of the heat losses through the opening and significantly increases building energy savings.

Practical air volume flows with regard to industrial air curtain units are between approximately 1.200 m<sup>3</sup>/h and 12.000 m<sup>3</sup>/h per meter air curtain unit at installation heights as from 3 metres to approximately 7-8 metres.

### Special air curtain units

Other air curtain units are also defined by their special applications (i.e. chilled/cold storage, insect protection, pollution control, smoke protection and odours). In these cases, this can follow different performance, controls and/or positioning criteria, so their correct installation should be in consultation with the manufacturer.

### Cold chambers

Special air curtain units used for instance in chilled or cold storage applications are used to create a barrier of air to reduce warm moist air entering the refrigerated space and cold air leaving the space; their correct positioning must be defined together with the manufacturer. Their main purpose is to create a non-obstructive barrier to limit refrigeration energy losses, ice forming on the cold room cooling system, increasing reactive maintenance, and ice forming on the floor of the doorway which is a slip hazard.

### Pollution or odour control

Special air curtain units used in other applications, typically pollution or odour control, should be positioned on the 'clean side' of the opening to ensure that the air stream doesn't have contaminants.

### Insect protection

Special air curtain units are used to minimise the entrance of flies or other flying insects in food establishments, hospitals, factories, clean areas, etc.

This specific application requires a powerful barrier achieved by using a very high air speed across the whole opening to stop properly the insects approaching. The correct air speed must be defined together with the manufacturer for the particular situation.

This means that for the same opening, an air curtain unit for insects' prevention must be more powerful than one used for climate separation application in order to effectively repel the entrance of flying insects. So, it is important to select the correct air curtain unit for insect repellent application, otherwise it will not be effective.

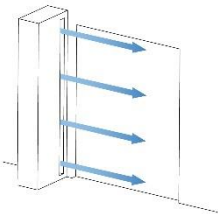
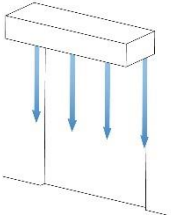
Following the requirements of the American NSF / ANSI Standard 37 "Air curtains for Entrance ways in Food and Food Services Establishments" it is accepted that you can reduce the insect's penetration by more than 99%.

## Properties of air curtain units

### Type of installation

Type of installation	Description	Advantages and Disadvantages
Free hanging / Free standing	The unit is fully exposed to the room.	<p>Advantages</p> <ul style="list-style-type: none"> <li>- Mounting height and position can be set easily</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- The air curtain unit is less discrete and so options to style the unit may need to be considered (paint colours or finishes etc).</li> </ul>
Recessed	The unit is installed in or above the room's ceiling.	<p>Advantages</p> <ul style="list-style-type: none"> <li>- Unit installation is more discrete</li> <li>- Services can be hidden within the ceiling</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- Mounting height is determined by the ceiling height and good access is required to the ceiling void.</li> </ul>

### Mounting orientation

Type of installation	Description	Advantages and Disadvantages
Vertical	<p>The unit is installed vertically next to the opening. It can be on one or both sides of the opening. Typically for wider openings it is better to install the units on both left and right sides, in this case, the consultation of an expert designer or manufacturer is recommended.</p>  <p><b>Figure 3: vertical installation</b></p>	<p>Advantages</p> <ul style="list-style-type: none"> <li>- No overhead room is required</li> <li>- Less risk when used in industrial environments with tall vehicles</li> <li>- Improved effectiveness for narrow tall doorways</li> <li>- Multiple units can be stacked on top of each other</li> <li>- For special applications, they can be used (potentially also with horizontal air curtain units) to seal around obstructions such as trains or lorries that are parked within the opening.</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- Floor space is used up, in commercial environments, this may obstruct other equipment like security barriers.</li> <li>- Protections are recommended for industrial environments to prevent damages</li> </ul>
Horizontal	<p>The unit is installed above the opening to blow down towards the floor. This is the most common type of air curtain unit installation.</p>  <p><b>Figure 4: horizontal installation</b></p>	<p>Advantages</p> <ul style="list-style-type: none"> <li>- No floor space is required as the unit is directly installed above the opening.</li> <li>- Multiple units can be joined together to allow wider openings to be covered (such as when multiple doors are positioned side by side).</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- Tall, narrow openings are covered less effectively</li> <li>- Potential to be hit by tall vehicles (i.e. forklifts), so protective bars may need to be installed to protect the unit from damage</li> <li>- In industrial installations - careful positioning is required to not interfere with roller/shutter doors</li> </ul>

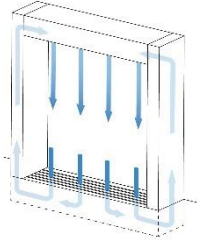
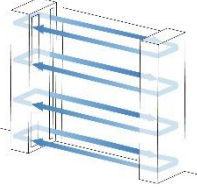
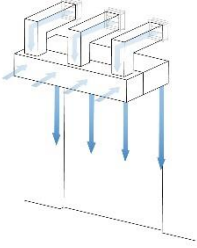
		<ul style="list-style-type: none"> <li>- In commercial installations – careful positioning is required to not interfere with fire exit signs or automatic door controls that are typically also installed above the opening.</li> </ul>
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**Air Stream Shape**

Type of installation	Description	Advantages and Disadvantages
Standard Linear	The outlet is straight and runs parallel to the opening.	Refer to mounting type - horizontal
Curved for revolving doors	The unit is fitted with either a curved outlet to wrap around revolving doors or alternatively multiple nozzles that can be ducted to the revolving doorway.	Please refer to the dedicated in-depth paragraph 'Application of entrance revolving doors' below

### Airflow Type

Type of installation	Description	Advantages and Disadvantages
Non- Recirculated air	This is the most common type of air curtain unit where the air is taken from the room the air curtain unit is installed in, filtered and then blown across the opening. Filtering is done typically to protect the unit and ensure it has a long service life when maintained regularly.	<p>Advantages</p> <ul style="list-style-type: none"> <li>- Easier installation as external openings, in floor ducts or multiple units in the building aren't required</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- The air curtain unit can only function as an air curtain, it cannot play an active role in ventilating the building, only assisting other ventilation equipment that is installed.</li> <li>- Effectiveness is reduced compared to other installation types and so extreme conditions (high temperature differences or high wind speeds) may have comparatively high infiltration rates.</li> </ul>
Recirculated air	A less common type of air curtain unit where the air is taken from the room the air curtain unit is installed in, filtered and blown across the opening as per previously, but a means of 'capturing' the air is provided, either by ductwork on the opposite site, or another air curtain unit to improve the recirculation of the air.	<p>Advantages</p> <ul style="list-style-type: none"> <li>- Easier installation as external openings in the building aren't required</li> <li>- Higher levels of effectiveness can be achieved as the air stream can be stronger than non-recirculated types, without causing turbulence.</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- The air curtain unit can only function as an air curtain, it cannot play an active role in ventilating the building only assisting other ventilation equipment that is installed.</li> </ul>

	 <p><b>Figure 5: vertical recirculation</b></p>  <p><b>Figure 6: horizontal recirculation</b></p>	
<p>Ventilation</p>	<p>A special type of air curtain unit where the air entering the air curtain unit can be taken from outside or an alternative source.</p>  <p><b>Figure 7: air curtain unit with additional external air</b></p>	<p>Advantages</p> <ul style="list-style-type: none"> <li>- This may be done to allow the air curtain unit to have a role in a night cooling strategy (free cooling) for a building.</li> <li>- Works actively as part of the ventilation system.</li> </ul> <p>Disadvantages</p> <p>Additional dampers, ductwork and/or silencers are required to be connected to the air curtain unit to allow it to work effectively.</p>

**Air Stream Quantity**

Type of installation	Description	Advantages and Disadvantages
<p>Multiple air streams (air jets) or air curtain units</p>	<p>Some air curtain units are designed such that they will blow multiple air streams across the opening. Typically, these are used with different outlet temperatures to</p>	<p>Advantages</p> <ul style="list-style-type: none"> <li>- Improved effectiveness leading to greater energy saving</li> </ul>

	<p>allow a gradient in temperature as people or goods move through the opening. The external air stream is used to protect the inner air streams.</p>	<ul style="list-style-type: none"> <li>- Applicable to special applications with harder conditions (cold chambers, draughts...)</li> </ul> <p>Disadvantages</p> <ul style="list-style-type: none"> <li>- Higher investment</li> <li>- First perception when walking through the air stream is that it's cooler than expected and no 'warm welcome' is experienced giving a lower level of thermal comfort.</li> </ul>
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### Application of entrance revolving doors

If based on a wind risk assessment it follows that a more than average risk of wind nuisance at the entrance opening must be considered, a facility must be implemented, for example, a revolving door to reduce the quantity of the ingress of outdoor air. Next, an air curtain unit can be deployed as the second step to reduce further the ingress of outdoor air and possibly to heat or cool the air.

Many air curtain unit suppliers have special bent/round air curtain units for revolving doors.

### Application to entrance lobbies

If an entrance lobby (vestibule) is used, the most effective and comfortable solution is to install two units, one inside and one between doors as shown in Figure 8.

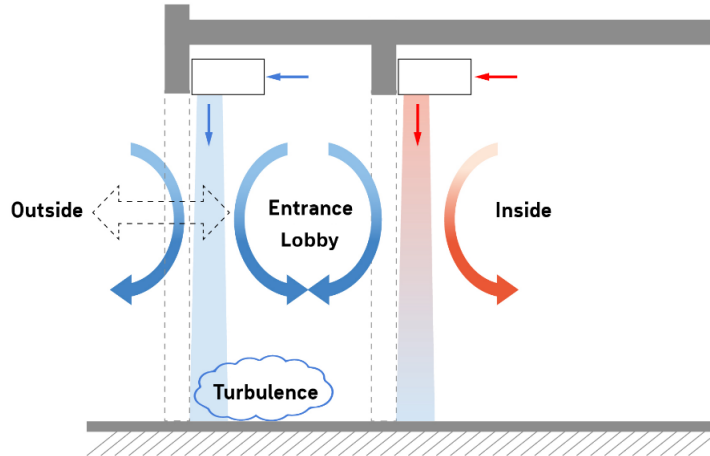


Figure 8: best solution for entrance lobby installation

In the case of a single unit, the installation as in the left situation in the Figure 9 (source ISSO 110) is better. If an air curtain unit is located in a small entrance lobby (on the right), a high level of turbulence will occur in the entrance lobby because much air movement is caused in a small area or room. This reduces the effectiveness of the climate division of the air curtain unit. The air movement can spread in a much larger area in the left situation where the air curtain unit is installed inside the building. Any supplied heating or cooling to the air curtain unit can basically not escape outside in the left situation while the blowing in of heat or cold in the entrance lobby has a negative influence on the heating or cooling that benefits the building. In the case of a single unit, the installation of the air curtain unit in accordance with the left situation is, therefore, the preferable.

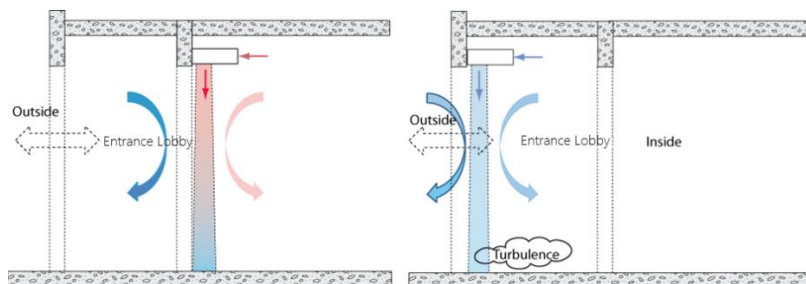


Figure 9: An air curtain unit in combination with an entrance lobby. Better protection is obtained in the left situation than in the right situation. There is also less heat loss to the outside in the case of a heated air curtain unit in the left situation than in the right situation.



### Classification by type of heating

Type of heating	Advantages	Disadvantages
Unheated	Lowest energy consumption of all the types of air curtain units.	<ul style="list-style-type: none"> <li>- Risk of discomfort for those working nearby</li> <li>- Reduced thermal comfort when entering the building.</li> </ul>
Electrical heated	<p>Depending on the element selection, these can be the fastest products to heat up the air stream.</p> <p>Can typically be used to give a heated air stream while other centralised heating systems are disabled (such as heat pumps or boilers).</p> <p>Installation can typically be done by just an electrician without the need for other professionals.</p>	<ul style="list-style-type: none"> <li>- Spare electric capacity is required on site.</li> <li>- Larger, thicker cables may need to be run to provide power to the product.</li> <li>- Higher risk of thermal overheating and so thermal cutouts are required.</li> <li>- Preventive maintenance plans should be in place to ensure that filters are cleaned – this is important to ensure that the product is working effectively</li> </ul>
Water heated	Product can have higher heating efficiency as the water is heated from an energy efficient source.	<ul style="list-style-type: none"> <li>- Larger pipework sizes than refrigerant based units that can make the unit installation more visible.</li> <li>- Leaks can occur and damage the building fabric.</li> <li>- Maintenance on the heat exchanger can be more difficult as it will require draining first.</li> <li>- Unit commissioning required to set flow rate and ensure system is balanced correctly</li> </ul>
From heat pump (direct expansion coil)	One of the most efficient ways to heat the air stream. This can result in lower operating costs over the lifetime of the product. Exact operation costs are derived from the SCOP of the heat pump.	<ul style="list-style-type: none"> <li>- The overall investment is typically higher for the product as it requires a more involved installation process.</li> <li>- The outdoor unit can require defrosting periodically. During this time the air curtain unit will either blow cool or ambient air. This effect can be mitigated by the application of defrost heaters when the</li> </ul>

		unit operates like an electrically heated unit.
Hybrid: mixed heating system (water, electricity, direct expansion)	<p>Allows to be more flexible with heating sources and power consumption.</p> <p>The main heating system capacity can be reduced thanks to the contribute of the hybrid air curtain unit.</p>	<ul style="list-style-type: none"> <li>- Has the same installation and operational disadvantages as electric, water and direct expansion heated units.</li> </ul>

## About Eurovent

Eurovent is Europe's Industry Association for Indoor Climate (HVAC), Process Cooling, and Food Cold Chain Technologies. Its members from throughout Europe represent more than 1.000 organisations, the majority small and medium-sized manufacturers. Based on objective and verifiable data, these account for a combined annual turnover of more than 30bn EUR, employing around 150.000 people within the association's geographic area. This makes Eurovent one of the largest cross-regional industry committees of its kind. The organisation's activities are based on highly valued democratic decision-making principles, ensuring a level playing field for the entire industry independent from organisation sizes or membership fees.

## Our Member Associations

Our Member Associations are major national sector associations from Europe that represent manufacturers in the area of Indoor Climate (HVAC), Process Cooling, Food Cold Chain, and Industrial Ventilation technologies.

The more than 1.000 manufacturers within our network (Eurovent 'Affiliated Manufacturers' and 'Corresponding Members') are represented in Eurovent activities in a democratic and transparent manner.

→ For in-depth information and a list of all our members, visit [www.eurovent.eu](http://www.eurovent.eu)