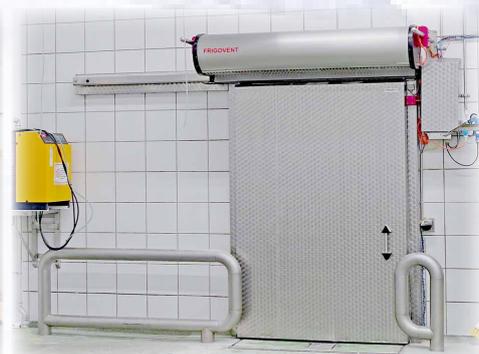


# FRIGOVENT air curtains

for cold store doors and gates



**AUGUST 2018**

# The harmful air exchange of open coldroom or freezer room doors



## Problems with open coldstore doors

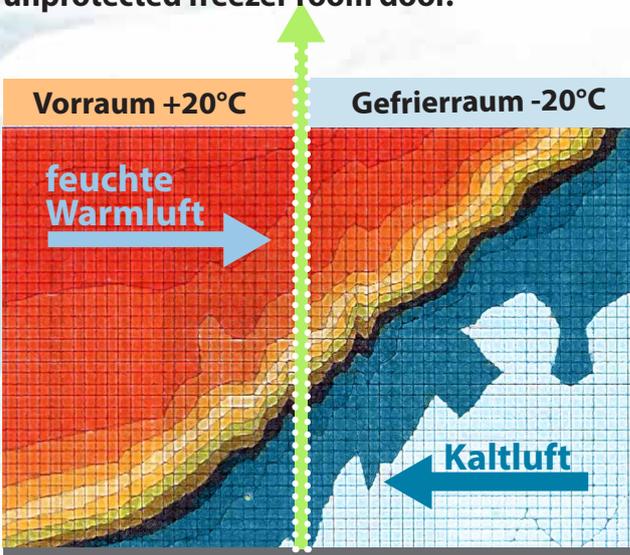
Cold air is heavier than warm air.

When the cold store door is open the heavy cold air flows to the outside at the bottom of the opened door .

At the same time the lighter warm and humid external air enters the cold store through the top of the door opening.



Thermography of air temperatures at an open, unprotected freezer room door.



When observing an unprotected door opening, it is clear that the coldroom or freezer room warms up considerably by the harmful air exchange. This has many disadvantages for the operator of the coldroom.

**The consequences:**

**High energy costs, ice formation and increased risk of accidents.**

The warm air, flowed into the cold store must be cooled again with a high energy expenditure. This causes unnecessarily high energy costs.

The humidity of the warm air settles as frost and ice.

Icing on the goods and icing at the freezer ceiling.

Ice at the evaporator of the cold store. The ice must be defrosted with high energy costs.

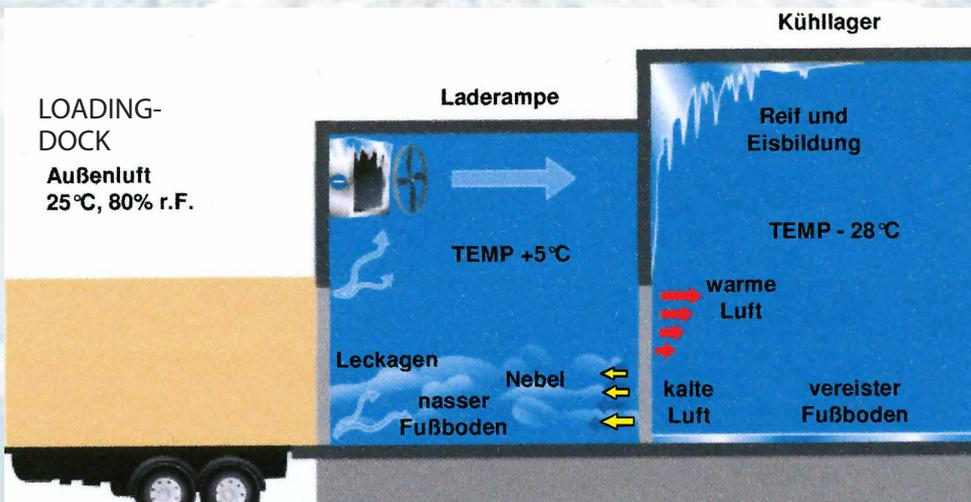
Ice forming on the freezer floor causes extreme risk of accidents of employees.

Door openings are sealed with conventional strip curtains or swinging doors. These doors get covered with condensation or become frozen over. This causes a dangerous obstruction. The risk of accidents increases significantly.

Accidents caused by iced doors and black ice on the floor cost the frozen food industry annually about 35 millions Euro.



**For example: Coldstore warehouse with loading dock**



# Air curtains effectively and comfortably seal open doors.



Air curtain Type A-EC 250 over a freezer sliding door

## What is an air curtain and how does an air curtain work?

FRIGOVENT air curtains are invisible doors of air. They eliminate all problems caused by open cold room doors without hindering.

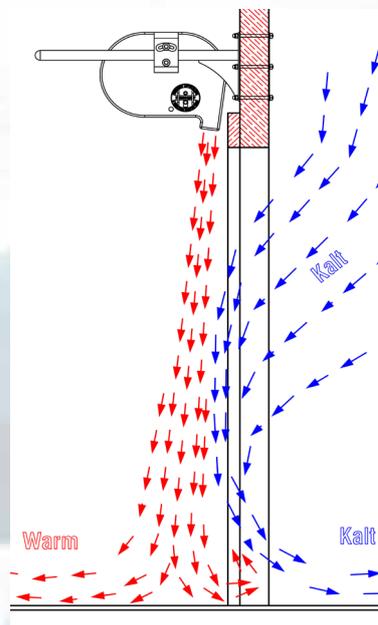
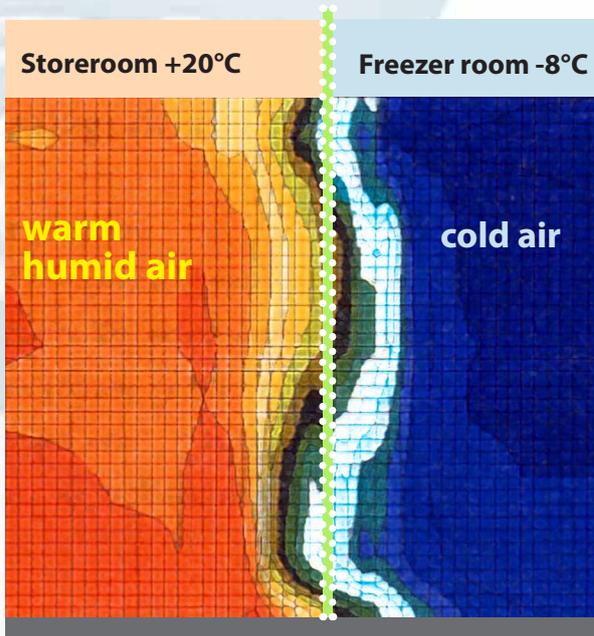
An air curtain is mounted above the door opening.

When opening the door, an air curtain immediately switches on automatically.

It instantly forms a specially air flow, which develops an invisible door in front of the door opening.

This is why cold air does no longer escape out of the freezer room and warm air can not enter.

## Thermography of air temperatures at an open freezer room door, which is sealed off by an air curtain system.



When observing the door opening with mounted air curtain system, it is clear that the refrigerator or freezer room is protected from harmful air exchange.

Different temperature zones are separated from one another. This has many advantages for the operator of the warehouse.



FRIGOVENT TYPE A-EC 225 in a meat factory



### What benefits do you have with air curtains ?

- + Prevent ice formation
- + They don't hinder the traffic because the door openings are free
- + Air curtains are hygienic
- + Air curtains save a lot of energy

Safe, unhindered, hygienic goods and passenger transport through the free door opening. No delay in operation. You cannot be disturbed by dirty swing doors or strip curtains. The door opening and the stored goods are effectively protected from damage. There is no ice formation at ceilings, walls, floor and goods anymore. Evaporator coils and fans remain free of ice and it is not necessary to additional defrost. A reliable refrigeration of products and their quality is guaranteed.



# Frigovent - Wand the cold stays in the cold store even with open doors!

## Hygienic correct

Fulfills all hygienic requirements of the food industry

## Ice free freezing room

No hoarfrost at refrigerated goods, no ice accumulation at the ceiling, floor and evaporator.

## Mosquito stop

Doors with air curtains detain mosquitoes and flying insects to enter.

## No risk of damage

Air curtains cannot be damaged. They are installed above the door, so that they are out of the working area of forklifts.

## Energy saving

Significant reduction of electricity costs by stopping the waste of expensive cold air.

## Protecting the goods

There is no incorrect increase of the temperature in the freezing room and your goods are reliably protected.

## A comfortable transport of goods ensures a smooth operating procedure

Goods can be transported comfortably through the free door opening.

## The investment pays off quickly

A FRIGOVENT air curtain over a freezer door with 30 openings of 40 seconds per day pays for itself within a short time by energy savings! Return of investment within one or two years.





**Improvement of the transport of goods.  
Accident prevention.  
See and be seen.**

The pictures show air curtain type G-EC 275.

The door openings are now completely free.  
The forklift drivers have a clear view.  
There is no longer any damage or contamination of the refrigerated goods by means of swinging doors or strip curtains.

The goods can now be unhindered,  
Can be quickly and safely transported through  
the completely free door opening.



### 1. Air curtain in cantilever construction for mounting on large gates

The housing of the air curtain system can be mounted cantilevered over a distance up to 6 meters. During assembly, the system is placed on two brackets, which are mounted next to the door opening. On the brackets, the air curtains can be pushed up to one meter of the door opening. So the Frigovent is particularly suitable for extra-wide door openings with cold room and freezer room sliding doors.

### 2. High operating safety.

Whenever the door is opened, a proximity switch activates the air curtain just when the door is removed from the switch. So the fans are already powered up when the door is fully opened. This is a special switch. It is completely sealed without any moving parts. It is totally waterproofed and works with an operating current of only 24 volts. It is a security switch, which cannot cause any electrical accidents.

### 3. The control of air velocity and air flow.

When adjusting the air curtain system the air discharge angle and the air speed must be set. The airspeed and thus the airflow is electronically controlled in all our blowers. It can very easily be adjusted stepless.

### 4. Even in continuous operation the power consumption is extremely low and the operation sound too.

The air curtains can be equipped with AC blowers or electronically commutated EC blowers. The energy consumption of EC blowers with electronically commutated motors is up to 50% less than the consumption of AC blowers. The power regulation is very advanced. The in operating noises are lower. The lifetime is longer.

We recommend the use of EC-blowers for doors which are open for a longer time.



### 5. An optimal laminar airflow separates cold air of the cooling chamber of the warm and humid air of the antechamber.

FRIGOVENT air curtains are mounted on the warm side of the wall above cold store door. The fans suck the warm air of the antechamber and blow it through the air nozzles and through the air rectifier down on the ground.

**When the airflow hits the ground, it divides so that the cold air remains in the cold room and the warm air stays outside.**

The air flow is generated by radial blowers. It becomes compressed in the pressure chamber of the housing.

Then it is accelerated through the nozzle and subsequently rectified by an air rectifier and spread over the entire unit width.

The rectifier consists of hundreds of blowpipes. It smoothes the airflow, so that it is tighter and the ranges is higher.

The result is a homogeneous, turbulence-free air curtain with high penetration and stable flow direction, which does not mix with the entrained air masses.

So a particularly effective operation is ensured.



## 6. Fast and easy service

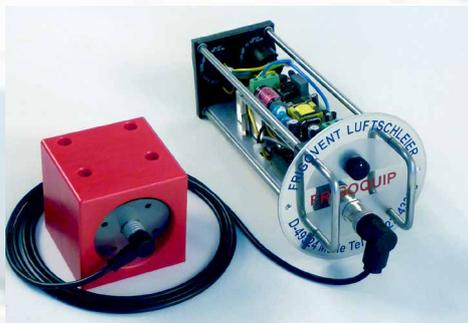
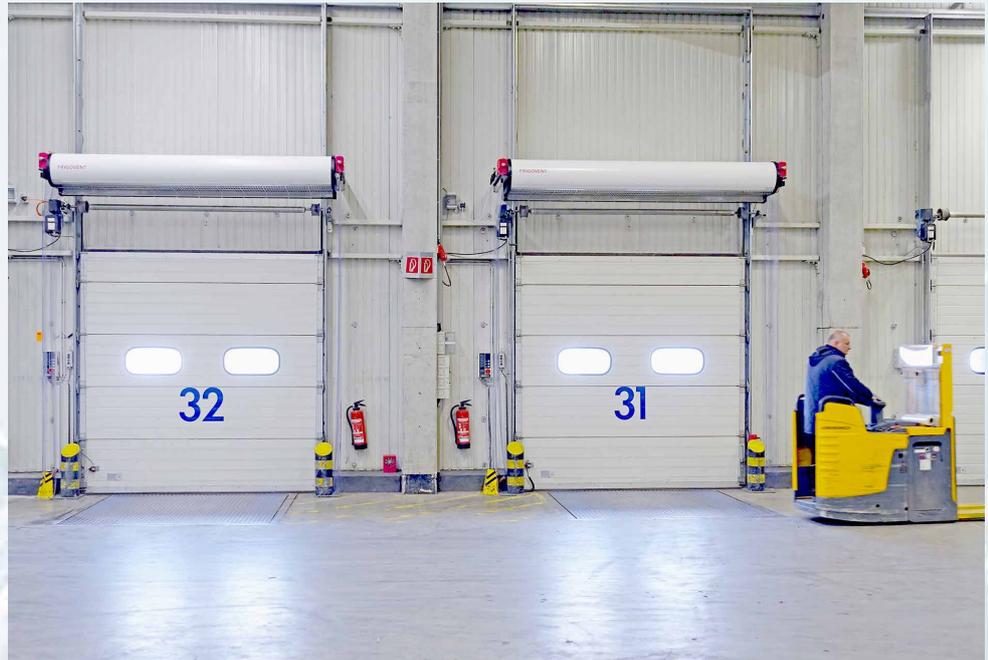
The system is controlled electronically. There is a slide-in control with the electronics and all critical components, such as:

- The control of the fan speed.
- The circuit of the fan by contactless relays.
- The generation of the safety current - 24 Volt DC - for the proximity switch.
- The waterproof connector for this switch.

In case of failure, this slide-in control can be pulled by the operator and exchanged with a new one quickly.

This eliminates time-consuming troubleshooting and allows a quick repair.

So a global fast service is available.



## 7. Very long durability, quiet, maintenance-free and reliable.

The air curtains are manufactured in a corrosion-resistant and a silenced execution.

The housings are made of a modern sandwich material with a core from polyäthylene and a surfaced of aluminum. This material has very good properties regarding to sound insulation, corrosion and stability. All other load-bearing parts of the air curtains are made from solid plastic and stainless steel.

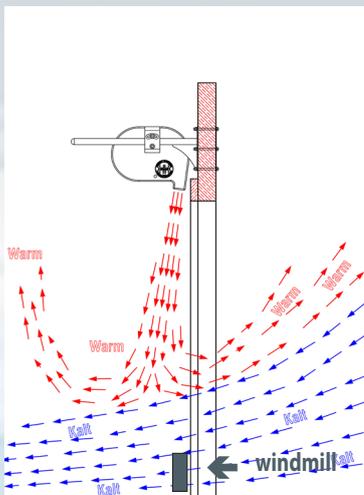
The air curtains are produced according to the the protection class IP54.

For type A and B the wheels of the centrifugal blowers consist of fiber reinforced plastic and the housings of the blowers are made from stainless steel.

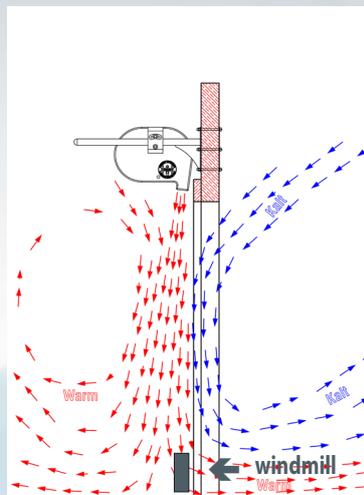
The blowers of the other models are made from galvanized steel. All other parts , as well as all the screws and brackets, are made of stainless steel or of solid plastic.

**FRIGOVENT ... so that the cold remains in the cold room even with open doors!**

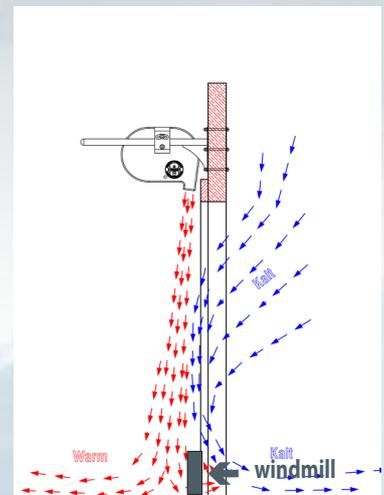




**WRONG**  
 The air speed is too low.  
 The airflow does not reach the ground.  
 Cold air flows out.  
 Air speed must be increased !



**WRONG**  
 The air velocity is too high.  
 Ineffective and disruptive air turbulences  
 are incurring.  
 Reduce air speed!



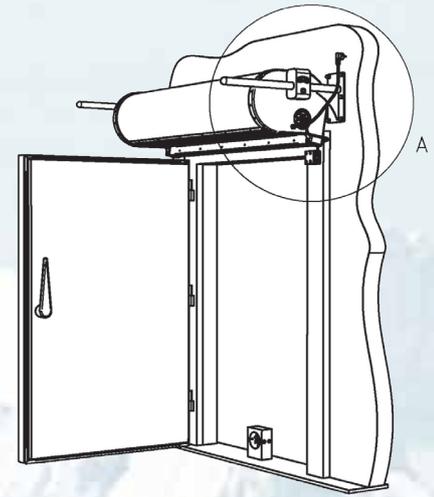
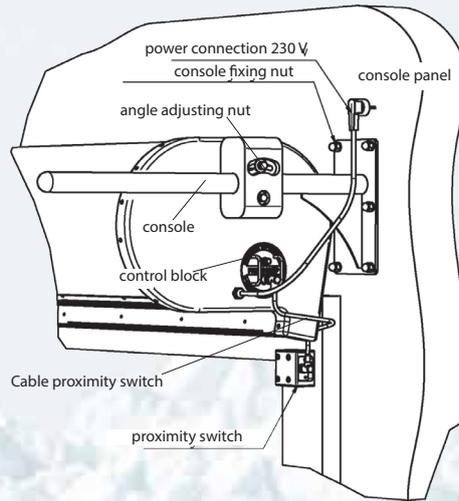
**CORRECT**  
 The impeller of the mill does not move.  
 The air velocity and the discharge angle are  
 optimal. Cold air can not escape. Warm air  
 cannot enter the cold room.

## Mounting

The air curtain is mounted with two consoles above the door opening. The electric system must be secured with 16 A. Then the air curtain can be adjusted with the help of the windturbine.

The unit consists of:

- Nozzle with fans and control unit.
- Two stainless steel brackets.
- Watertight proximity switch with connecting cable.
- Fixings for clamp mounting at a panel wall or alternatively fixing material for mounting at masonry.
- Windmill for functional testing.



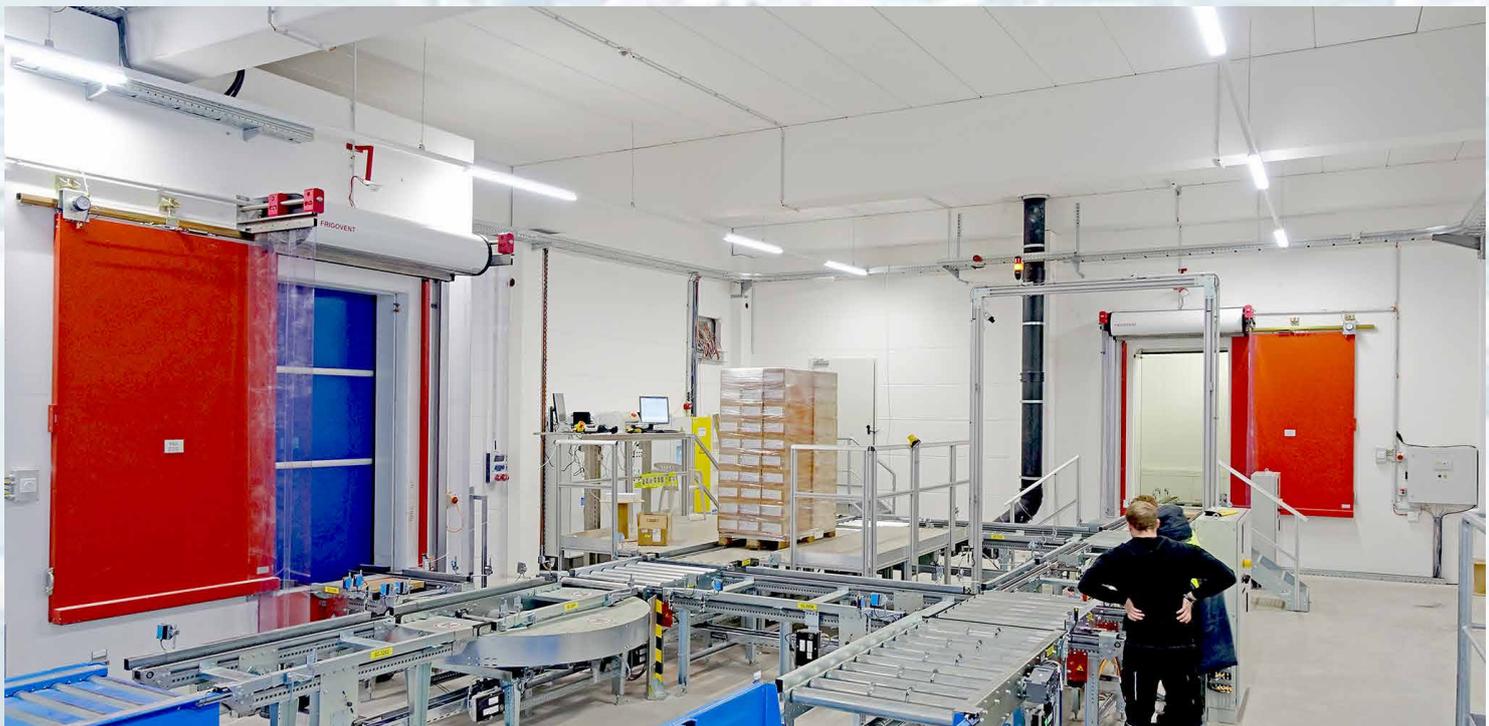
1. The air curtains must be mounted at the warm side of the door centrally above the door opening.
2. The unit should be pushed on the consoles with the blowers towards the door.
3. The proximity sensor turns the system on, when the door moves away from it. The sensor must be placed so, that the blowers of the air curtain start to run, when the door moves to open.
4. The nozzle must be adjusted, so that the air flow meets the floor in front of the door at an angle of 5 to 10 degrees.
5. The air flow is to be set with the

potentiometer so that it just reaches the ground. The speed must be kept low, because otherwise the airflow mixes with the air of the cold store.

6. The FRIGOVENT air curtain is optimally adjusted, when no outside air enters and when no cold air escapes. To check this, the windmill must be set on the threshold directly under the air flow. When the system is switched off, you can see how the impeller of the windmill is turning moved by the escaping cold air. If you switch on the air curtain and turn up the potentiometer you can see the impeller rotating more slowly until it finally stops. When the impeller stops, the

nozzle and the air speed are correctly adjusted.

7. Don't install air curtains in combination with strip curtains or swing doors.
8. The nozzle of the air curtain should be about 10% wider than the door.



# Cost savings by air curtains - Calculation (Example)

## Cost accounting:

**How much are the costs of the air exchange when opening a freezer room door?  
Calculation of a door with the clear opening 200 x 250cm.**

### How much cold air is lost per second?

It's all about the cost of a door opening in EURO. This will determine how much cold air is lost and how much warm air enters.

Cold air is 20% heavier than warm air and therefore it flows rapidly down out of the door opening. Through the upper part of the opening penetrates the same amount of warm air. The velocity of air movement is 1 m/sec.

Through an open freezer room door with the opening size of 200 x 250 cm per second 2.5m<sup>3</sup> cold air is lost.  
The same amount of warm air streames into the room and must be cooled.

At an open standing time of 40 seconds 100m<sup>3</sup> cold air is lost. The same amount of warm air has to be cooled in order to replace the lost cold air.

### How expensive is it to cool warm air from +20°C down to - 20°C ?

For the cooling of 1m<sup>3</sup> air from +20° C to - 20°C 100 kJ must be removed.  
100 kJ correspond to 0.028 KW/h or 24 kcal.

In order to produce 100m<sup>3</sup> cold air, 120m<sup>3</sup> warm air must be cooled. Each m<sup>3</sup> takes 0,028 KW/h  
120 x 0.028 = 3.36 kW /h.

For this, a chiller cooling unit also requires about 2,5 kW/h.  
At electricity costs of 20 cents per KW/h the energy costs for one door-opening come up to at least 0,50 EURO. Additionally there are the costs for repairs and depreciation.

A door opening with a cold air loss of 100m<sup>3</sup> cost at least 50 cents.  
15 EURO daily costs at 30 openings  
300 EURO per month,  
3600 EURO annually.  
By using air curtains you can save 80 to 90% of these costs.

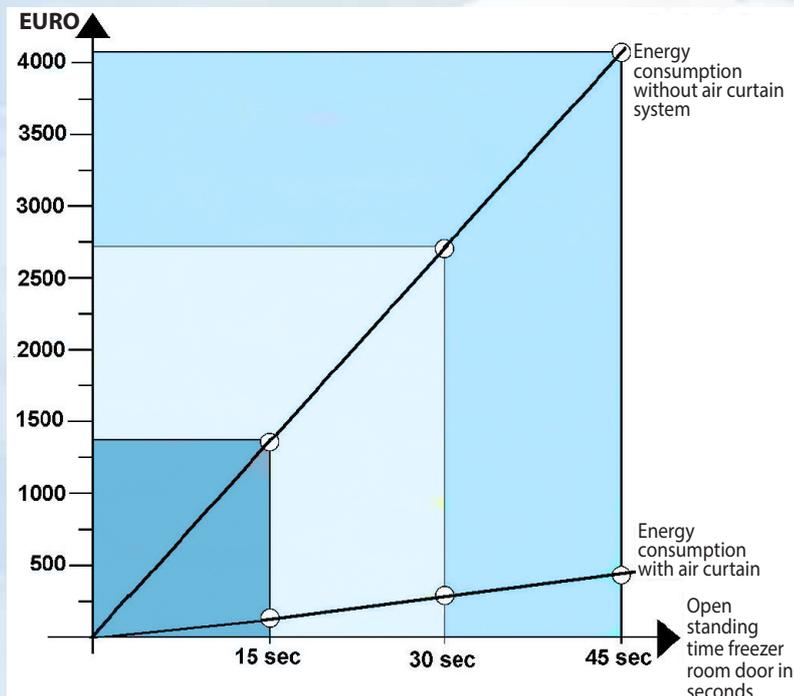
You can also make a test and collect the resulting condensation of the evaporator in a container.

Per cubic meter of warm air, which replaces the lost cold air, it must be cooled down and replaced, resulting 15 grams of condensation. so you have lost 650 cubic meters of cold air per 10 Liter bucket condensating water

For more than one bucket a day at the evaporator condensation water of your freezer room is obtained, you should think about buying an air curtain system.

## Energy costs caused by a freezer door without air curtain in € per year

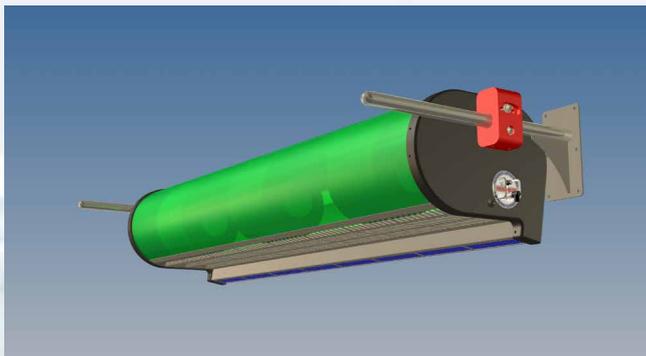
at 240 working days and 30 times opening with an open standing time of 40 seconds.





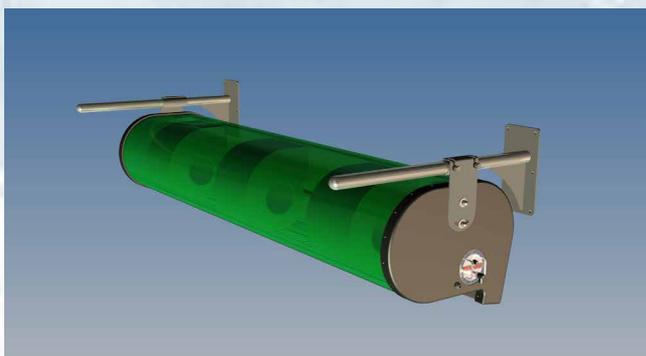
Protecting of sectional doors in a cooled loading area with FRIGOVENT Type F-EC 275

## Mounting options



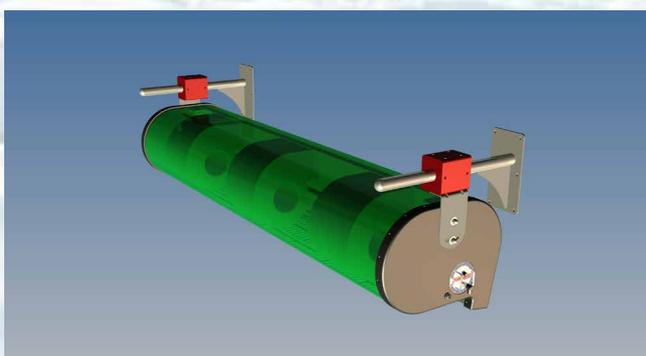
### Rear wall assembly with normal construction width

The FRIGOVENT is mounted with two stainless steel panels with solid polyamide blocks on the warm side of the wall above the door opening. This is the normal type of installation.



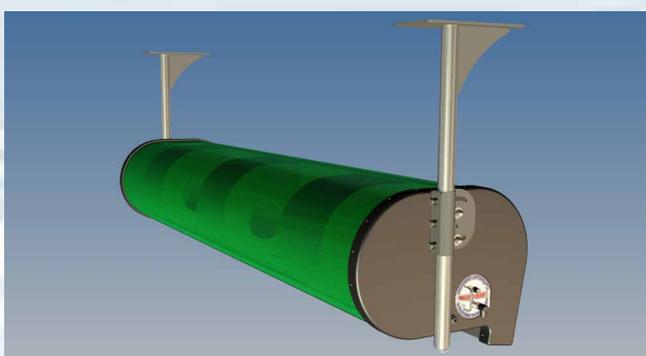
### Rear wall assembly with reduction of the construction width

The FRIGOVENT is mounted with two stainless steel brackets on the wall above the door opening. These consoles take up less space in the construction width - but need more space in the height.



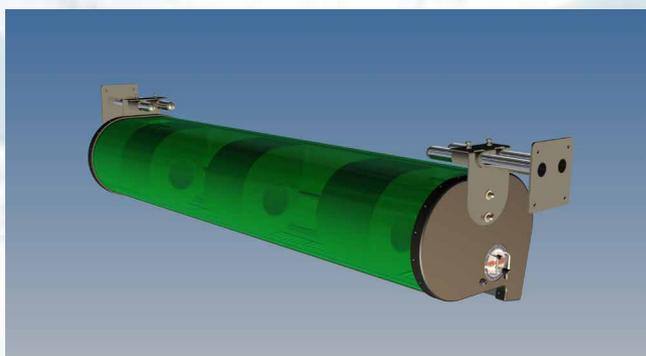
### Rear wall assembly Variable console distance

The FRIGOVENT is mounted with two stainless steel brackets with solid polyamide blocks preferably on the warm side of the wall above the door opening. If you can not mount the brackets in the right distance, it can be corrected by shifting the angle brackets below the polyamide blocks.



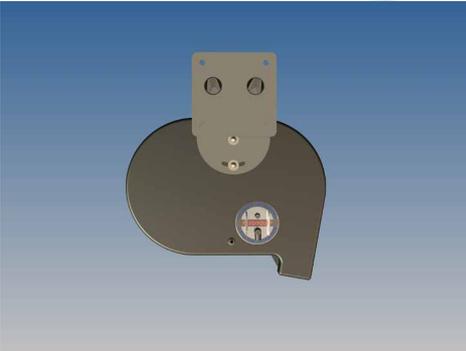
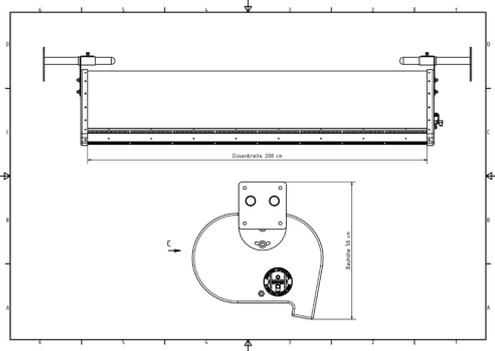
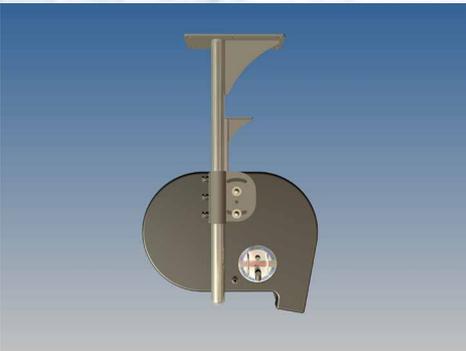
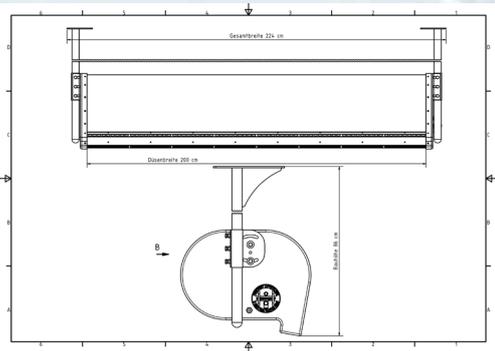
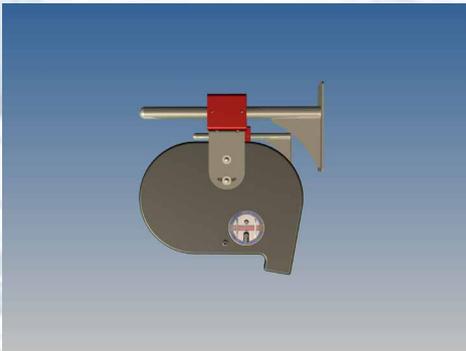
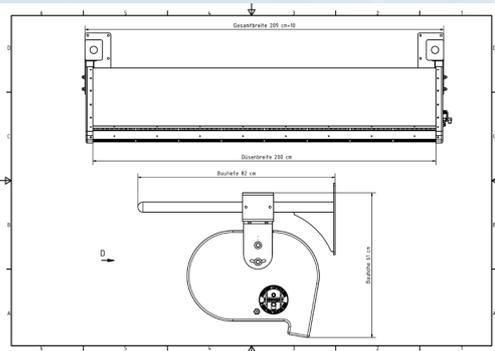
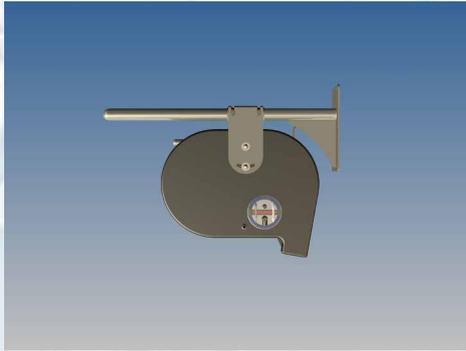
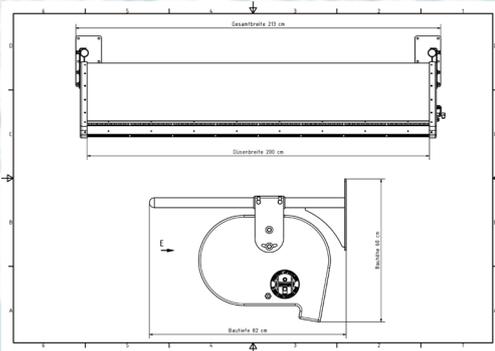
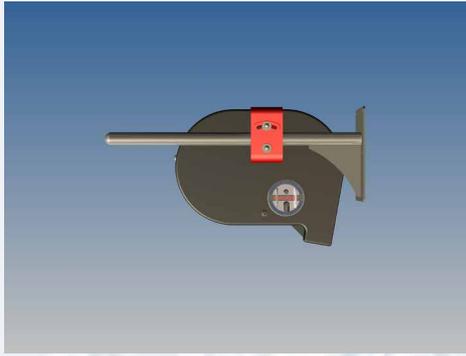
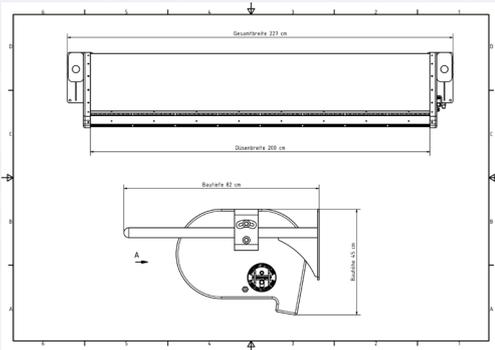
### Ceiling mounting with mounting under the ceiling

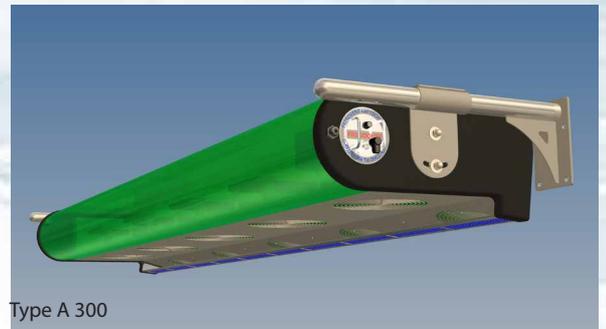
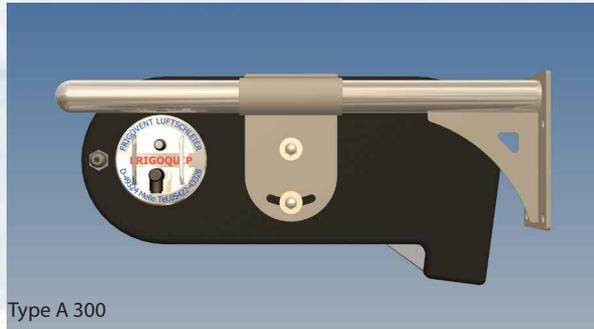
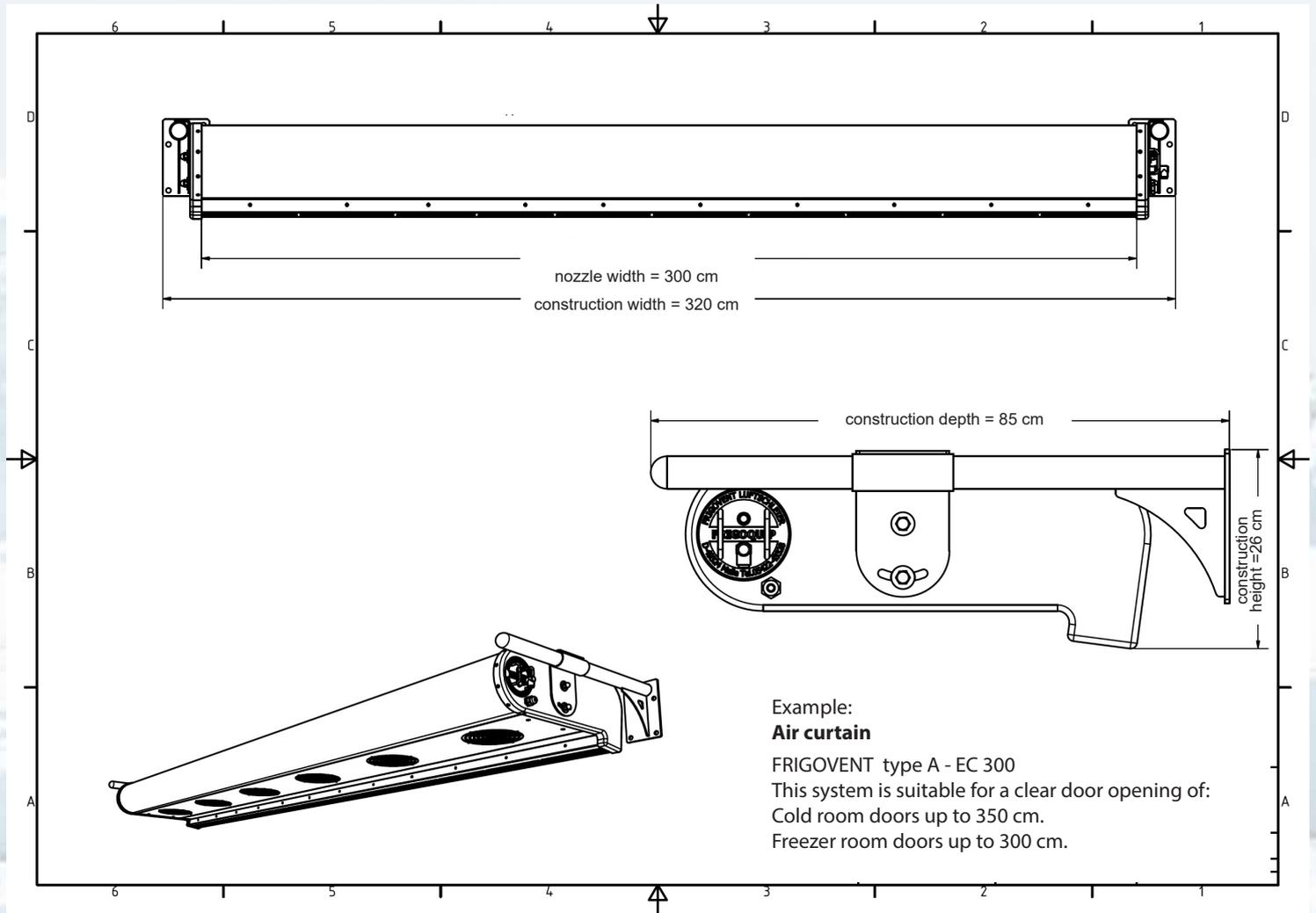
The FRIGOVENT is mounted with two stainless steel brackets under the ceiling above the door opening.



### Side mounting with mounting on the side walls

The FRIGOVENT is mounted with two stainless steel panels with polyamide solid plates on the side walls and in front of the door opening. This type of installation is often used in corridors that are sealed off by air curtains against cold air loss.





**FRIGOVENT air curtains type A and B are suitable for door widths up to 600 cm and for door heights up to 350 cm. Very low overall height - 26 cm. Especially corrosion resistant housing and blowers. Protecting class IP 54.**

**Execution**

The units are delivered complete and ready to use. A cantilevered housing with fans, outlet nozzle, consoles and electronics rack - mounted fully functional. The housing consists of a soundproof aluminum plastic composite material. Colour white. Alternatively, we can produce a stainless steel housings. The blowers are equipped with electronically commutated energy-efficient EC motors. The housings of the blowers and all remaining components of the air curtain consist largely of stainless steel. Suitable for use in humid environments - Protecting class IP 54.

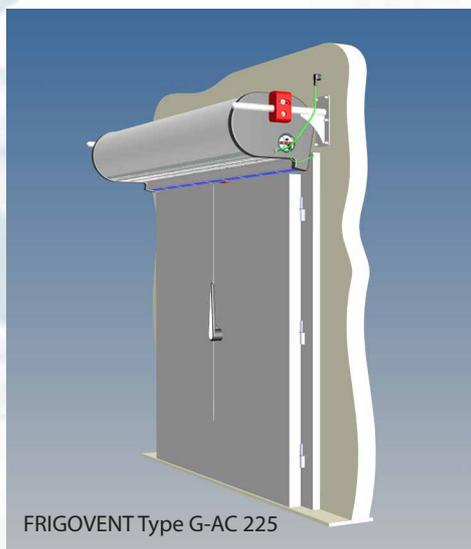
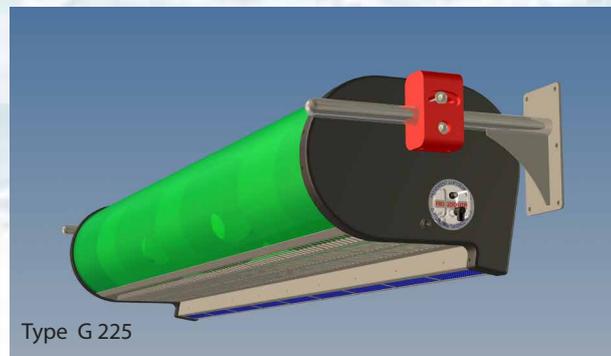
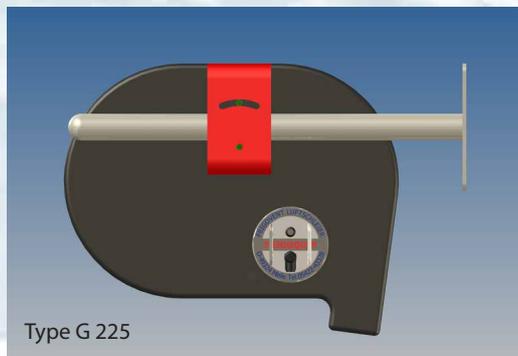
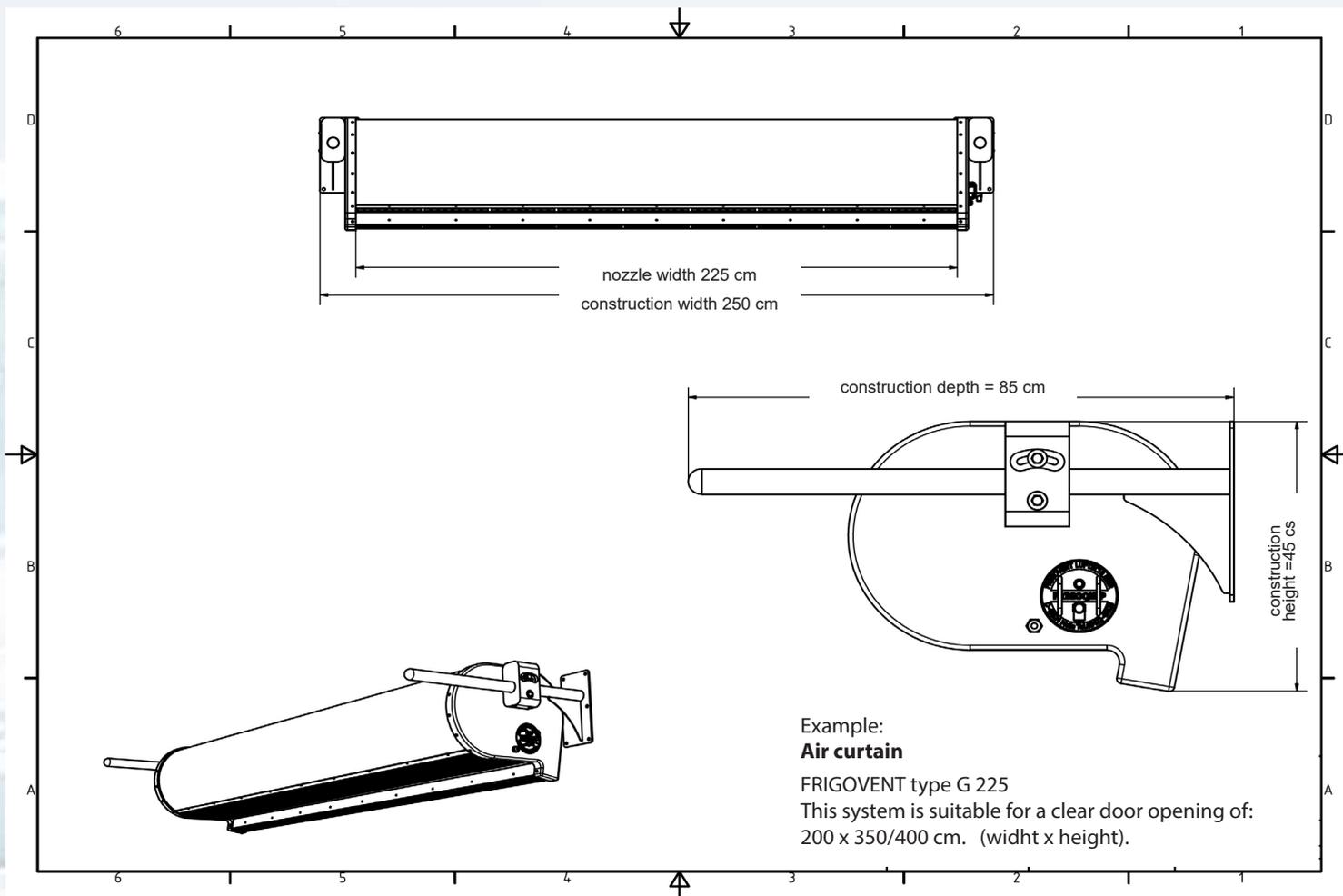
**Scope of delivery**

FRIGOVENT air curtain, two stainless steel brackets, stable windmill as an adjustment and proximity sensor with cable and screws. Stainless steel hardware for mounting on a panel wall or alternatively material to fasten at masonry.

**Assembly**

The air curtain can be installed by trained workers. We have several installation teams and install air curtains around the world.

Technical data		FRIGOVENT		Type A		and		Type B	
TYPE	Blowers		Weight		FRIGOVENT Type A		FRIGOVENT Type B		
	Width of outlet nozzle	pieces		FRIGOVENT Type B 10% more weight		suitable for following door heights indoor gates up to 300 cm outdoor gates up to 250 cm depending of wind Blowers with electronically commutated motors Voltage 230/1N~/50-60 air power nominal adsorption m³/h KW		suitable for following door heights indoor gates up to 350 cm outdoor gates up to 300 cm depending of wind Blowers with electronically commutated motors Voltage 230/1N~/50-60 air power nominal adsorption m³/h KW	
cm		A	B	with packing kg	without packing kg				
FRIGOVENT				Type A		Type B			
75	1	2	54	34	1.000	0,15	2.000	0,30	
100	2	3	66	43	2.000	0,30	3.000	0,45	
125	2	3	79	53	2.000	0,30	3.000	0,45	
150	3	4	93	64	3.000	0,45	4.000	0,60	
175	3	5	109	76	3.000	0,45	5.000	0,75	
200	4	6	121	85	4.000	0,60	6.000	0,90	
225	4	6	136	97	4.000	0,60	6.000	0,90	
250	5	7	150	108	5.000	0,75	7.000	1,05	
275	5	8	164	119	5.000	0,75	8.000	1,20	
300	6	9	178	130	6.000	0,90	9.000	1,35	
325	6	9	189	138	6.000	0,90	9.000	1,35	
350	7	10	203	149	7.000	1,05	10.000	1,50	
375	7	11	221	163	7.000	1,05	11.000	1,65	
400	8	12	231	170	8.000	1,20	12.000	1,80	
425	8	12	246	182	8.000	1,20	12.000	1,80	
450	9	13	260	193	9.000	1,35	13.000	1,95	
475	9	14	274	204	9.000	1,35	14.000	2,10	
500	10	15	288	215	10.000	1,50	15.000	2,25	
525	10	15	302	226	10.000	1,50	15.000	2,25	
550	11	16	315	236	11.000	1,65	16.000	2,40	
575	11	17	331	248	11.000	1,65	17.000	2,55	
600	12	18	346	260	12.000	1,80	18.000	2,70	
OPTIONAL									
All air curtains Type A and B also available for 110 V and for 60 Hz as well as 50 Hz.									
Off and on switch with control lamp instead of proximity switch - for continuous operation of the air curtain.									
Special consoles - Reduction of the width - Installation under the ceiling - Fixing to the side walls.									
Side windscreen from soft PVC strips to avoid lateral warm air intake.									
Separate control box with speed controller and off and on switch instead of control box in the device.									
DUPLEX Execution - two air curtains for one door - one curtain outside over the door - one curtain insde. For better performance.									
Housing made of stainless steel surface matt finish..									



**FRIGOVENT type F and G for doors with a width up to 600 cm and for doors with a height up to max. 400 cm.**

**Execution**

The units are delivered complete and ready to use. A cantilevered housing with fans, outlet nozzle, consoles and electronics rack - mounted fully functional.

The housing consists of a soundproof aluminum plastic composite material. Colour white.

Alternatively, we can make a stainless steel housing.

The blowers are optionally equipped with electronically commutated energy-efficient EC motors or with normal AC motors.

The remaining components of the system consist largely of stainless steel.

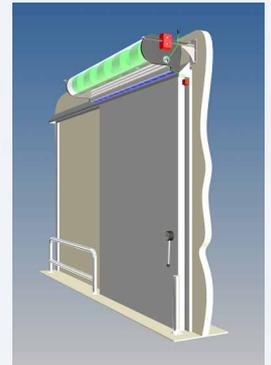
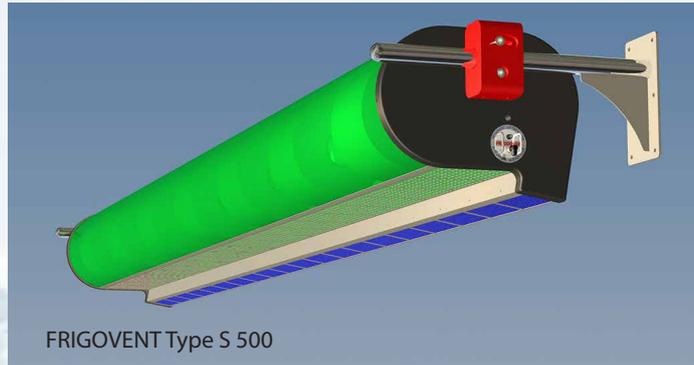
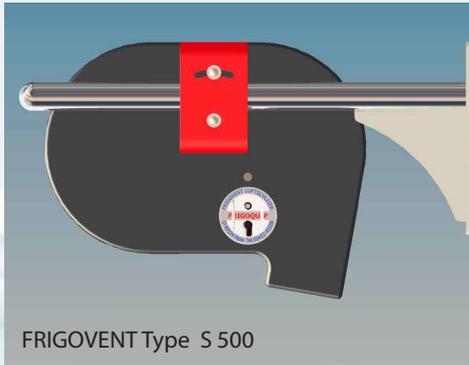
**Scope of delivery**

FRIGOVENT air curtain system, two stainless steel brackets, stable wind turbine as an adjustment and proximity sensor with cable and screw. Stainless steel mounting hardware for mounting on a panel wall or alternatively material to fasten at masonry.

**Assembly**

The air curtain can be installed by trained workers. We have several installation teams and install air curtains around the world.

Technical Data		FRIGOVENT		Type F		and		Type G	
TYPE	Blowers	Weight		FRIGOVENT Type F-AC		FRIGOVENT Type G-AC			
nozzle width		FRIGOVENT Type F FRIGOVENT Type G They are 10% heavier		with AC-radial blowers suitable for a clear door opening of Indoor doors up to 300 cm Outdoor doors up to 250 cm depending from windload		with AC-radial blowers suitable for a clear door opening of Indoor doors up to 400 cm Outdoor doors up to 350 cm depending from windload			
cm	pieces	with packing	without packing	air power	nominal adsorption	air power	nominal adsorption		
		kg	kg	m <sup>3</sup> /h	KW	m <sup>3</sup> /h	KW		
FRIGOVENT				Type F-AC		Type G-AC			
75	1	49	29	1.000	0,25	2.000	0,45		
100	1	55	32	1.000	0,25	2.000	0,45		
125	2	66	40	2.000	0,50	4.000	0,90		
150	2	72	43	2.000	0,50	4.000	0,90		
175	3	83	51	3.000	0,75	6.000	1,35		
200	3	89	54	3.000	0,75	6.000	1,35		
225	3	95	57	3.000	0,75	6.000	1,35		
250	4	106	65	4.000	1,00	8.000	1,80		
275	4	112	68	4.000	1,00	8.000	1,80		
300	5	123	76	5.000	1,25	10.000	2,25		
325	5	129	79	5.000	1,25	10.000	2,25		
350	5	134	81	5.000	1,25	10.000	2,25		
375	6	145	89	6.000	1,50	12.000	2,70		
400	6	151	92	6.000	1,50	12.000	2,70		
425	7	162	100	7.000	1,75	14.000	3,15		
450	7	168	103	7.000	1,75	14.000	3,15		
475	7	174	106	7.000	1,75	14.000	3,15		
500	8	185	114	8.000	2,00	16.000	3,60		
525	8	191	117	8.000	2,00	16.000	3,60		
550	9	202	125	9.000	2,25	18.000	4,05		
575	9	208	128	9.000	2,25	18.000	4,05		
600	9	214	131	9.000	2,25	18.000	4,05		
OPTIONAL									
EC blowers with electronically commutated motors up to 50% less power consumption									
On and off switch with indicator lamp instead of proximity switch for permanent use of the air curtain									
Special consoles for the reduction of the width, for mounting under the ceiling or at the side walls									
Side windshield made from soft PVC plates to avoid lateral warm air intake.									
Separate control box with speed controller and switch instead of switching in the device.									
Housing made of stainless steel surface matt finish.									



## FRIGOVENT type M and type S for doors width up to 600 cm and for a doors height up to max. 600 cm.

### Execution

The air curtains are delivered complete and ready to use. A cantilevered housing with blowers, outlet nozzle, consoles and electronics rack - mounted fully functional.

The housing consists of a soundproof aluminum plastic composite material. Colour white.. Alternatively, we can produce stainless steel housings.

The blowers of the types M and S are optionally equipped with electronically commutated energy-efficient EC motors or with normal AC motors.

Air curtains with EC blowers are more expensive but EC blowers consume up to 50% less electricity .

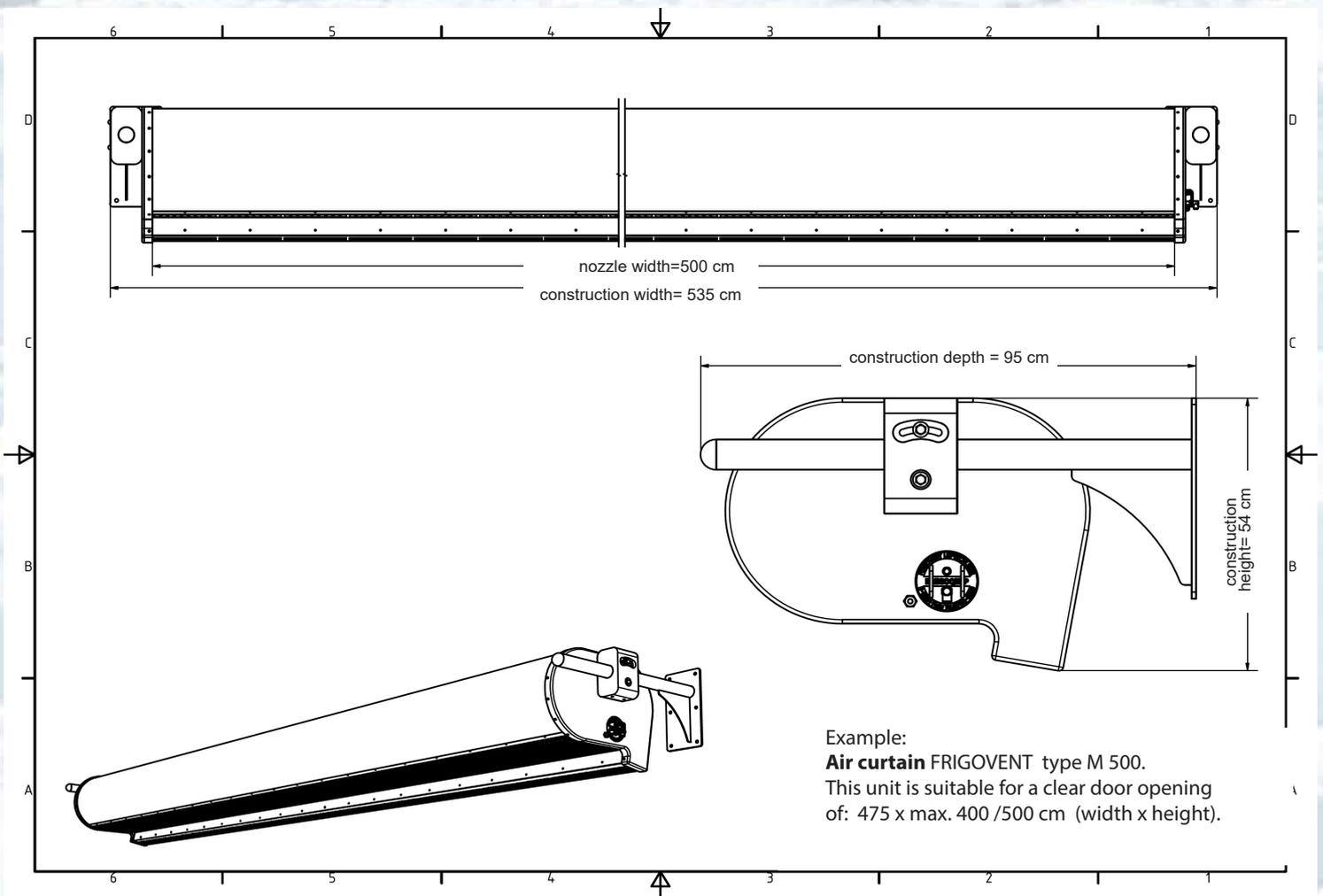
Therefore we recommend for doors which are open for long periods, air curtains with energy-saving EC fans. The remaining components of the air curtains consist largely of stainless steel.

### Scope of delivery

FRIGOVENT air curtain, two stainless steel brackets, a windmill as a help to adjust the system and a proximity sensor with cable and screws. Stainless steel mounting hardware for mounting at a panel wall or alternatively material to fasten at masonry.

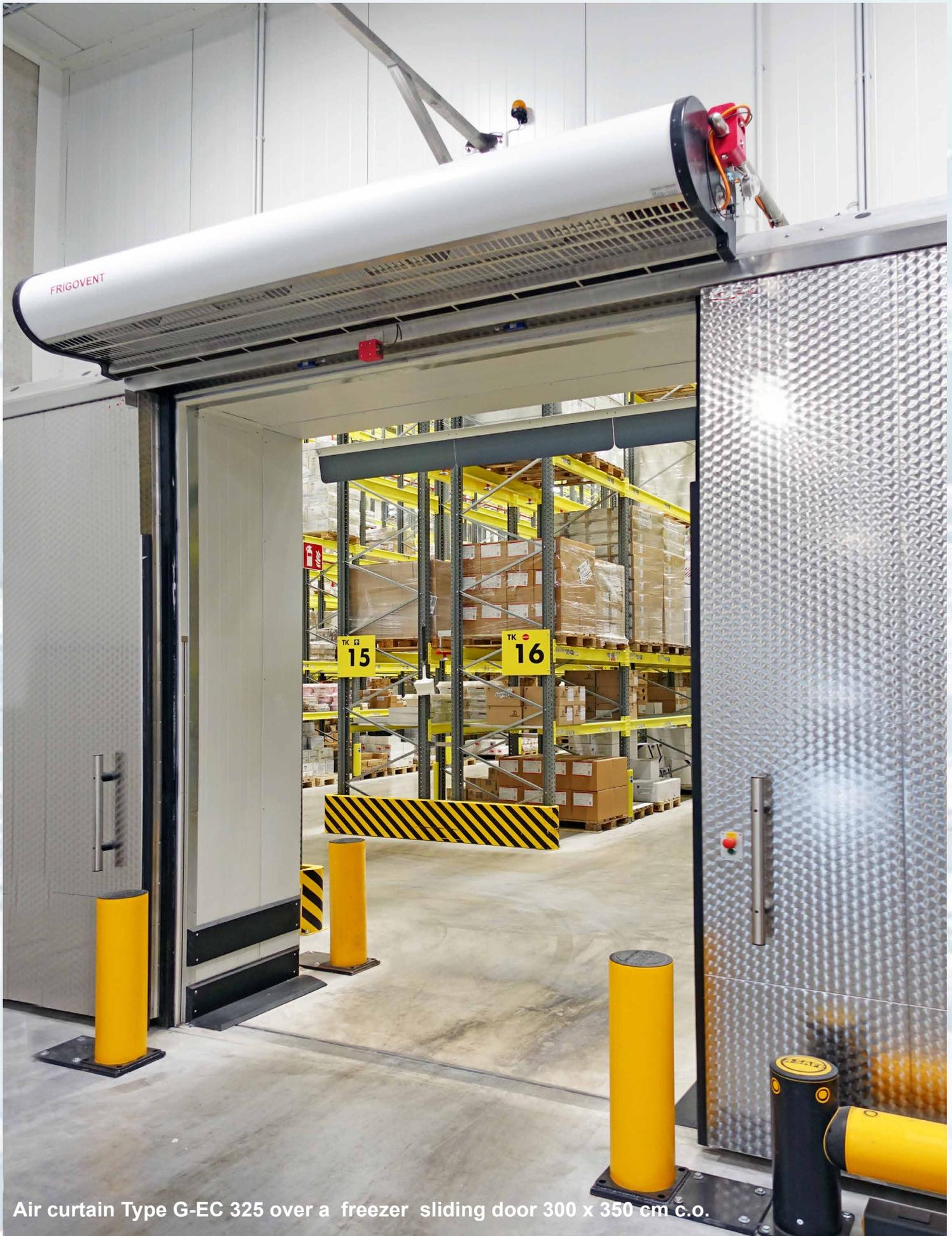
### Assembly

The air curtain can be installed by trained workers. We have several installation teams and install air curtains around the world.



Technical data		FRIGOVENT		Type M		and		Type S	
Type	Blowers	Weight		FRIGOVENT Type M-AC		FRIGOVENT Type S-AC			
nozzle width		FRIGOVENT Type M FRIGOVENT Type S They are 10% heavier		with AC-centrifugal blowers suitable for a clear door opening of Indoor doors up to 500cm Outdoor doors up to 400cm depending from windload		with AC-centrifugal blowers suitable for a clear door opening of Indoor doors up to 600cm Outdoor doors up to 500cm depending from windload			
cm	pieces	with packing	without packing	air power m³/h	nominal adsorption KW	air power m³/h	nominal adsorption KW		
FRIGOVENT				Type M-AC		Type S-AC			
100	1	70	41	3.000	0,70	4.000	1,0		
125	2	87	54	6.000	1,40	8.000	2,0		
150	2	95	58	6.000	1,40	8.000	2,0		
175	3	115	74	9.000	2,10	12.000	3,0		
200	3	123	78	9.000	2,10	12.000	3,0		
225	3	131	82	9.000	2,10	12.000	3,0		
250	4	148	95	12.000	2,80	16.000	4,0		
275	4	156	99	12.000	2,80	16.000	4,0		
300	5	176	115	15.000	3,50	20.000	5,0		
325	5	184	119	15.000	3,50	20.000	5,0		
350	5	192	123	15.000	3,50	20.000	5,0		
375	6	209	136	18.000	4,20	24.000	6,0		
400	6	217	140	18.000	4,20	24.000	6,0		
425	7	237	156	21.000	4,90	24.000	6,0		
450	7	245	160	21.000	4,90	28.000	7,0		
475	7	253	164	21.000	4,90	28.000	7,0		
500	8	270	177	24.000	5,60	32.000	8,0		
525	8	278	181	24.000	5,60	32.000	8,0		
550	9	298	197	27.000	6,30	36.000	9,0		
575	9	306	201	27.000	6,30	36.000	9,0		
600	9	314	205	27.000	6,30	36.000	9,0		
OPTIONAL									
EC blowers with electronically commutated motors up to 50% less power consumption.									
On-off Switch with indicator lamp instead of proximity switch for permanent use of the air curtain									
Special consoles for the reduction of the width, for mounting under the ceiling or at the side walls									
Side windshield made out of soft PVC plates to avoid lateral warm air intake.									
Separate control box with speed controller and switch instead of switching in the device.									
Housing made of stainless steel surface matt finish.									





Air curtain Type G-EC 325 over a freezer sliding door 300 x 350 cm c.o.

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