

# **2023 INDOOR GARDEN PAVILIONS AND SUPER STRUCTURE**

**FEBRUARY-2023**

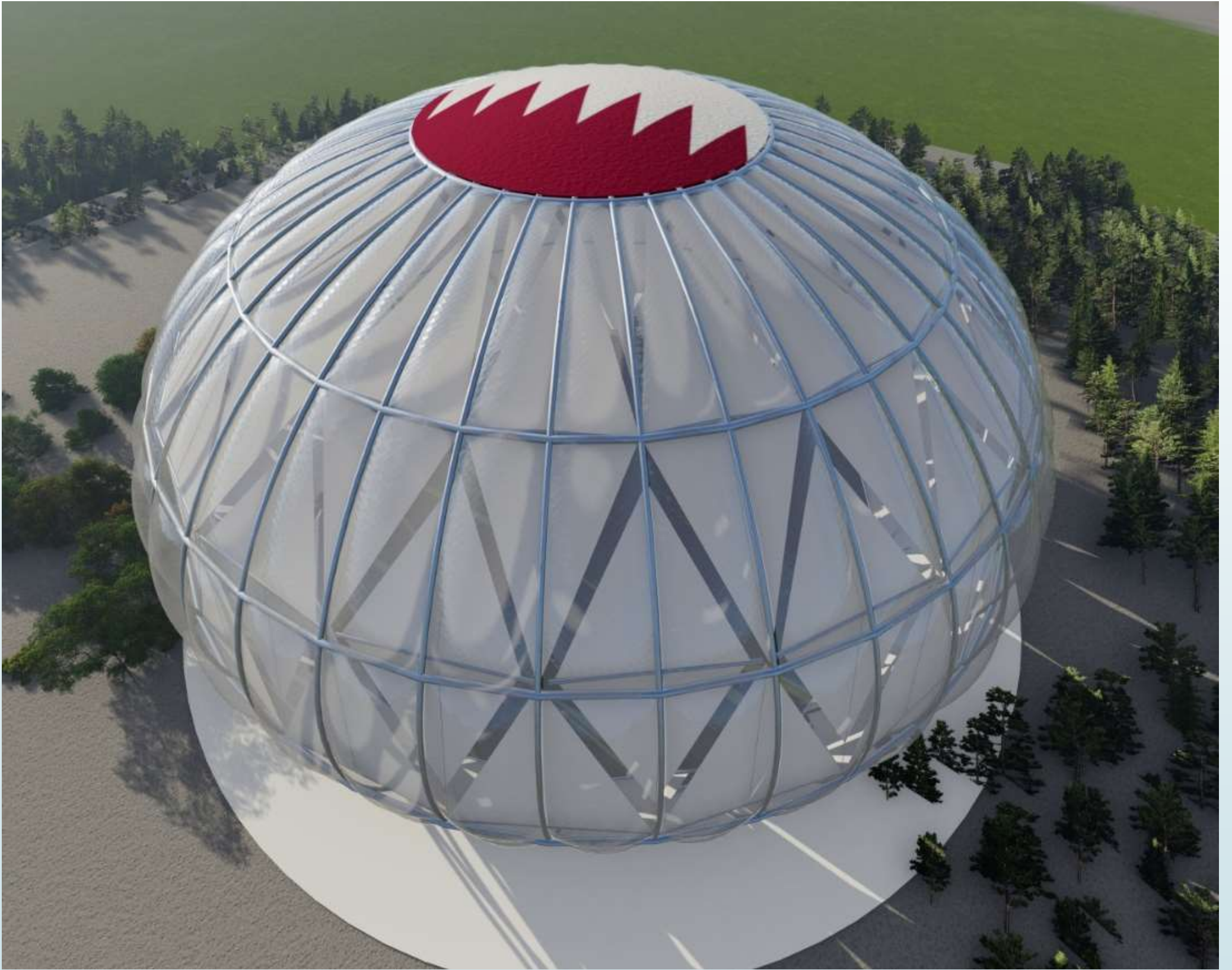


## Load assumptions considering Qatar environment:

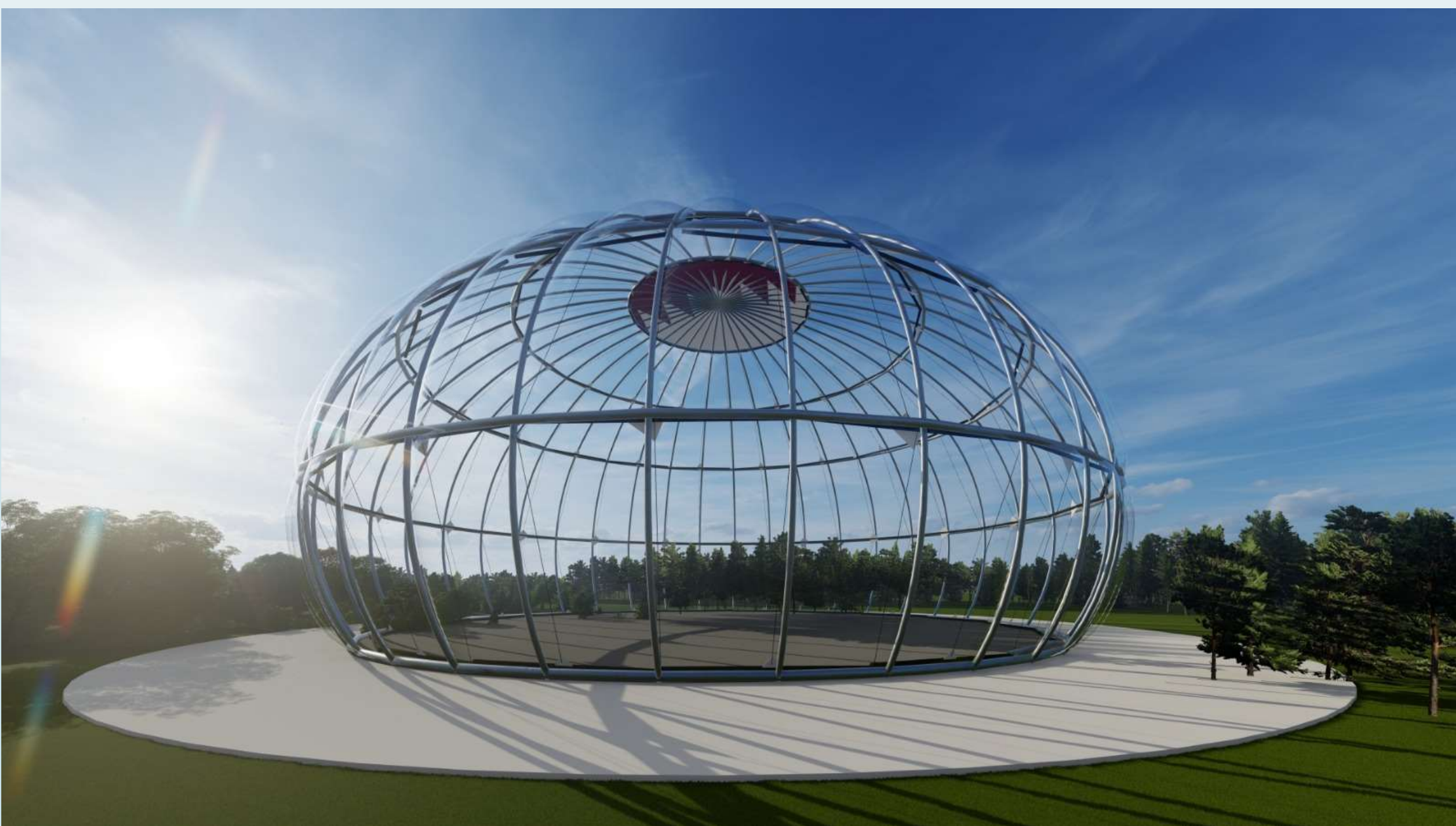
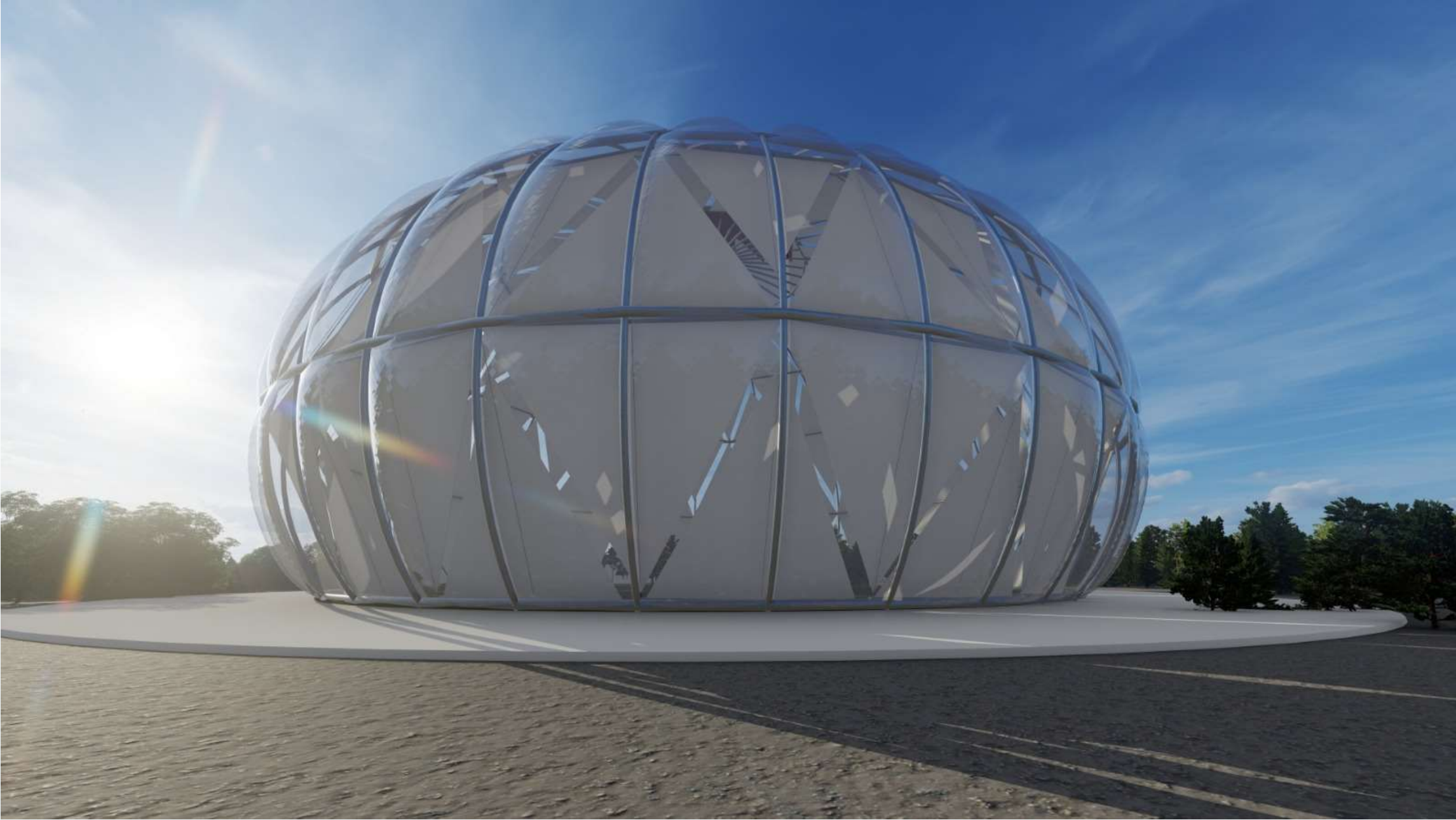
- Dead load construction factorized 1,1
- Cladding  $50\text{kg/m}^2$
- Installations  $10\text{kg/m}^2$
- Life load  $60\text{kg/m}^2$
- Wind 38 m/s (3sec gust)



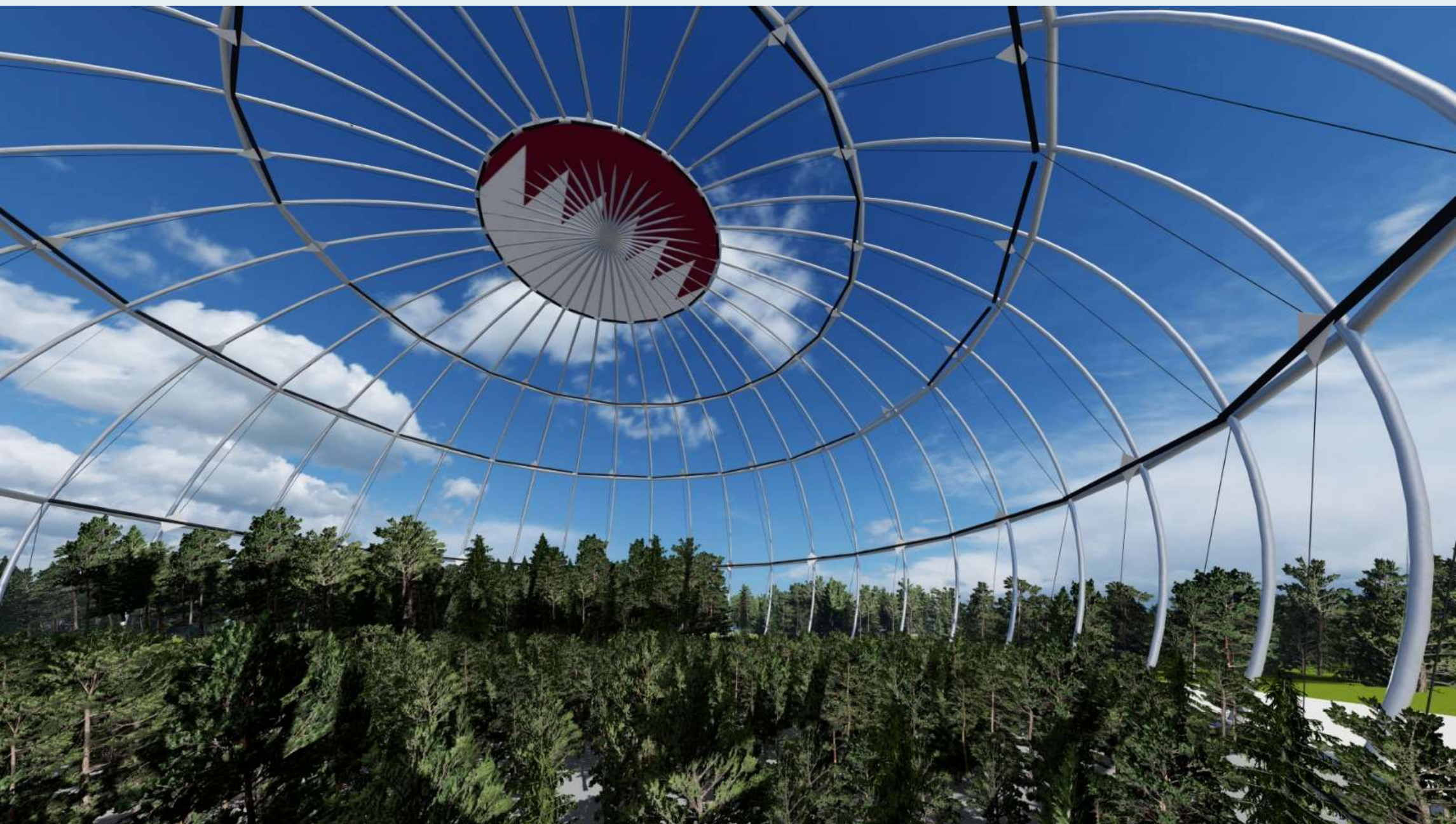
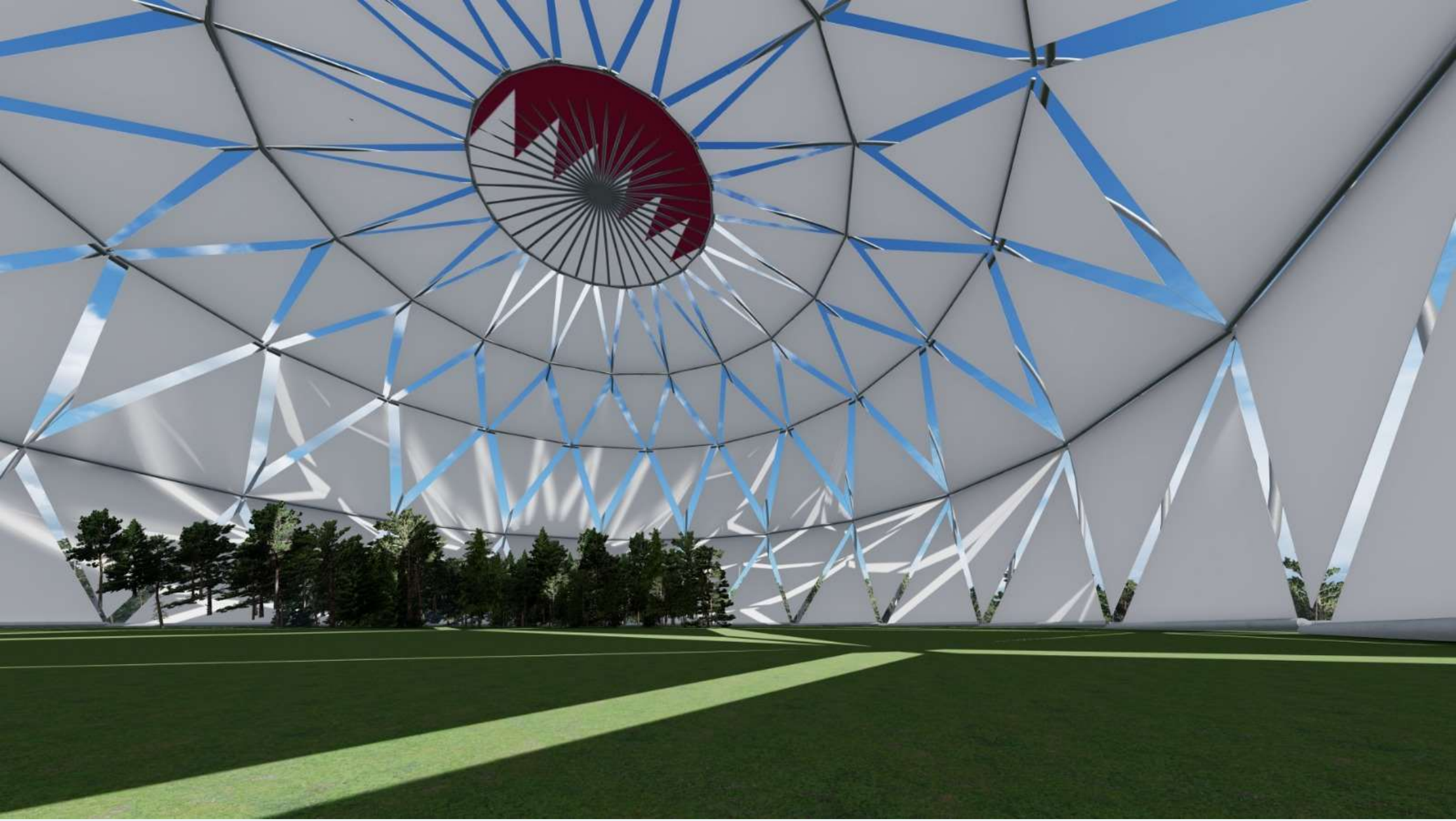




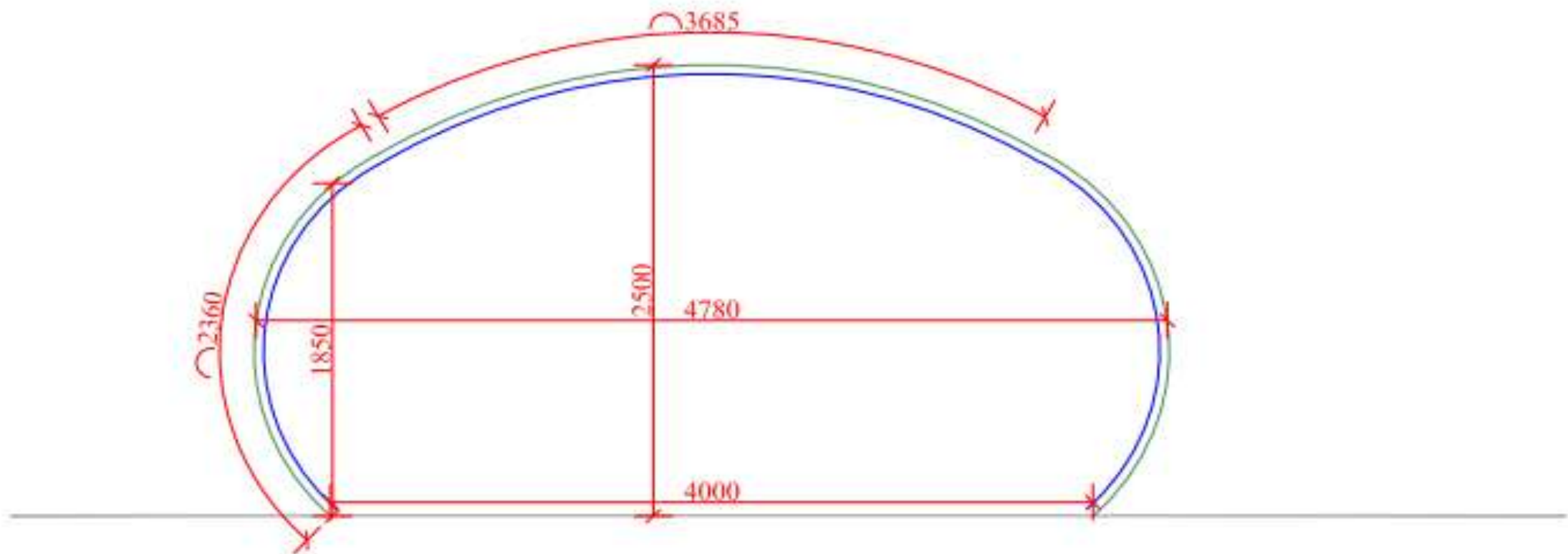
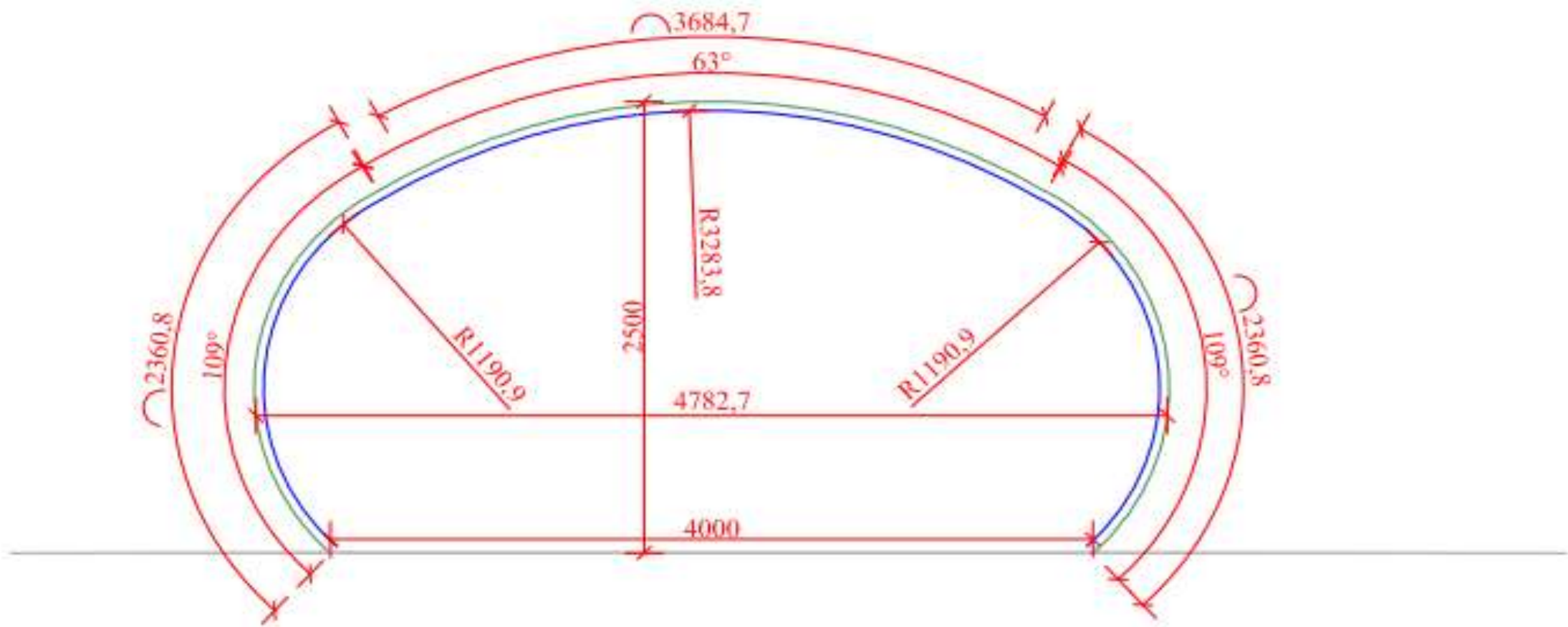
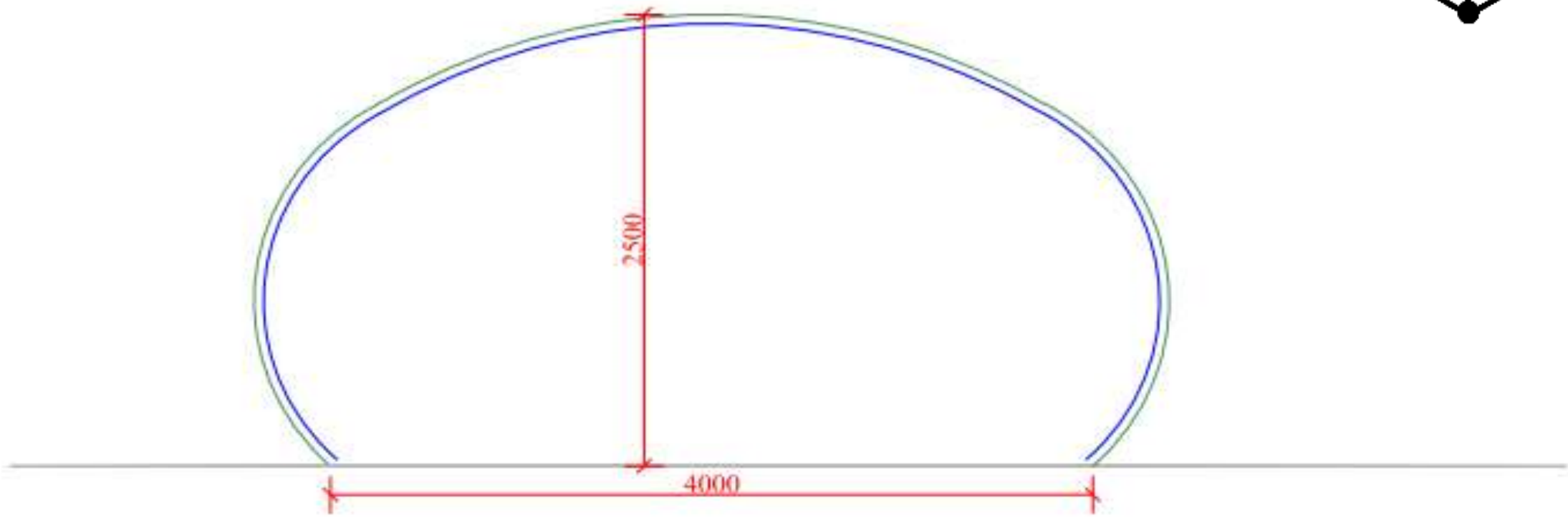
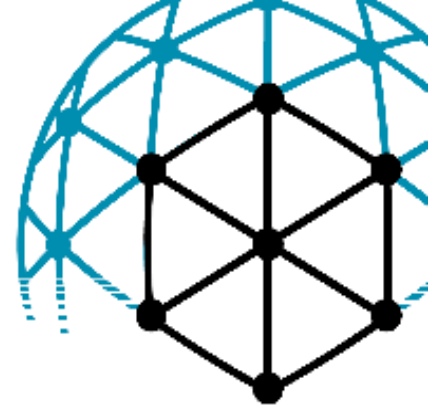




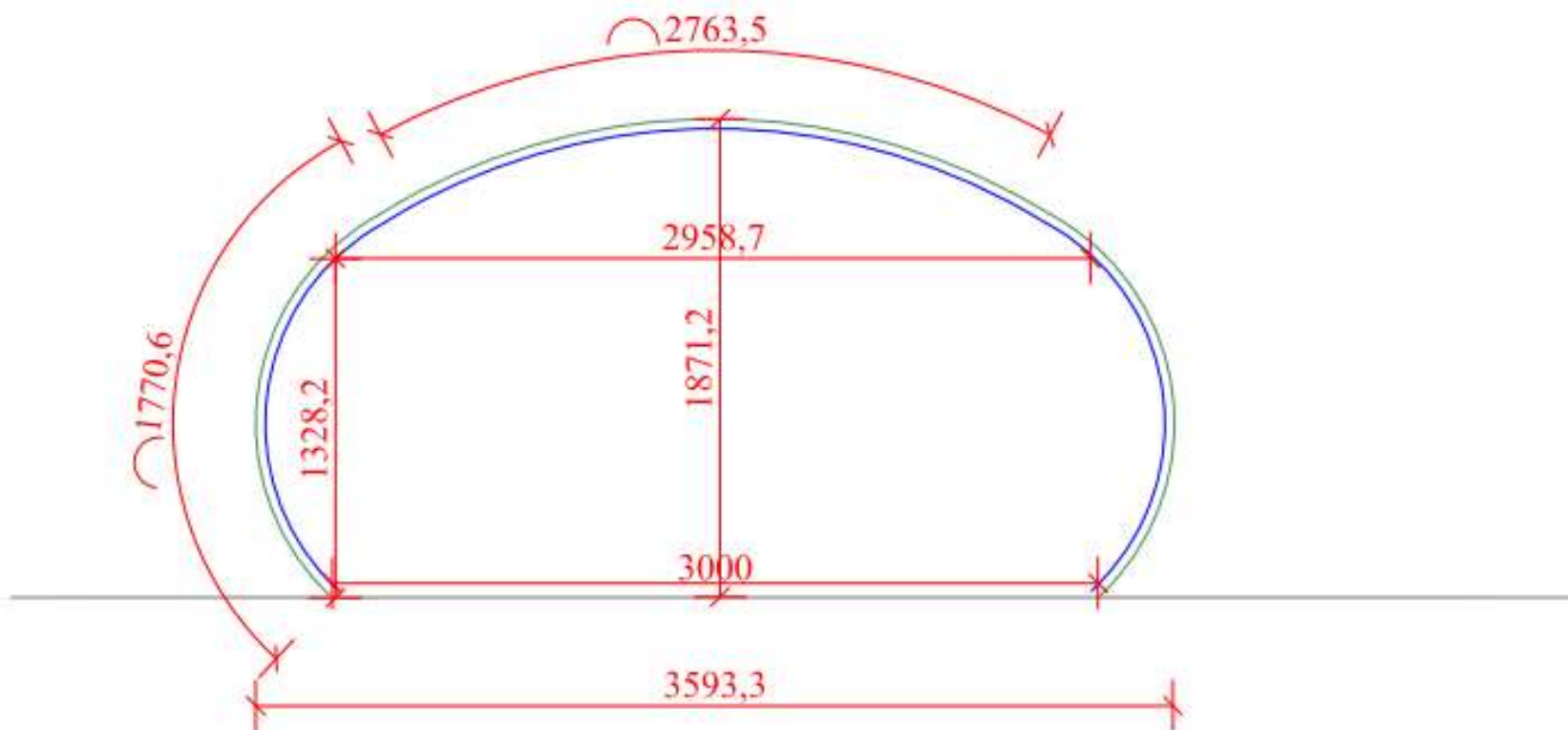
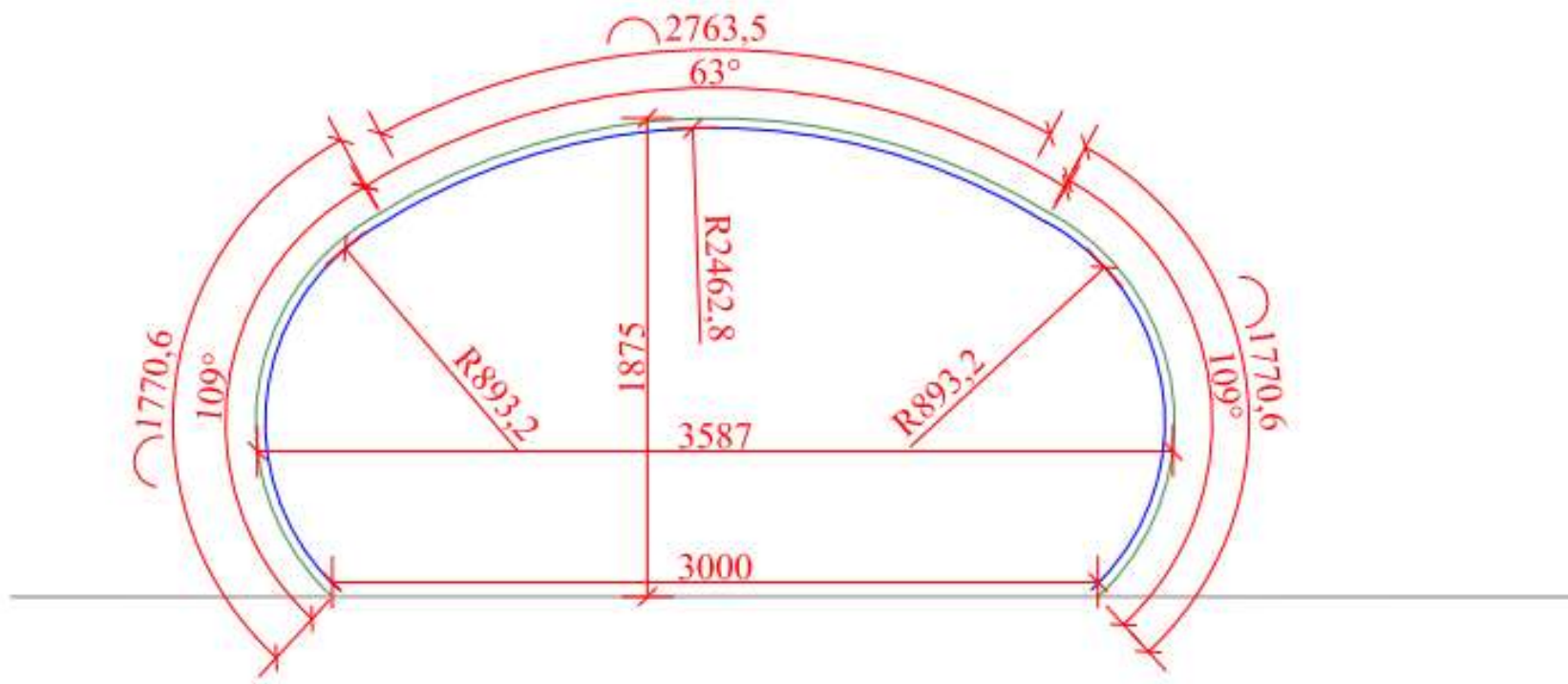
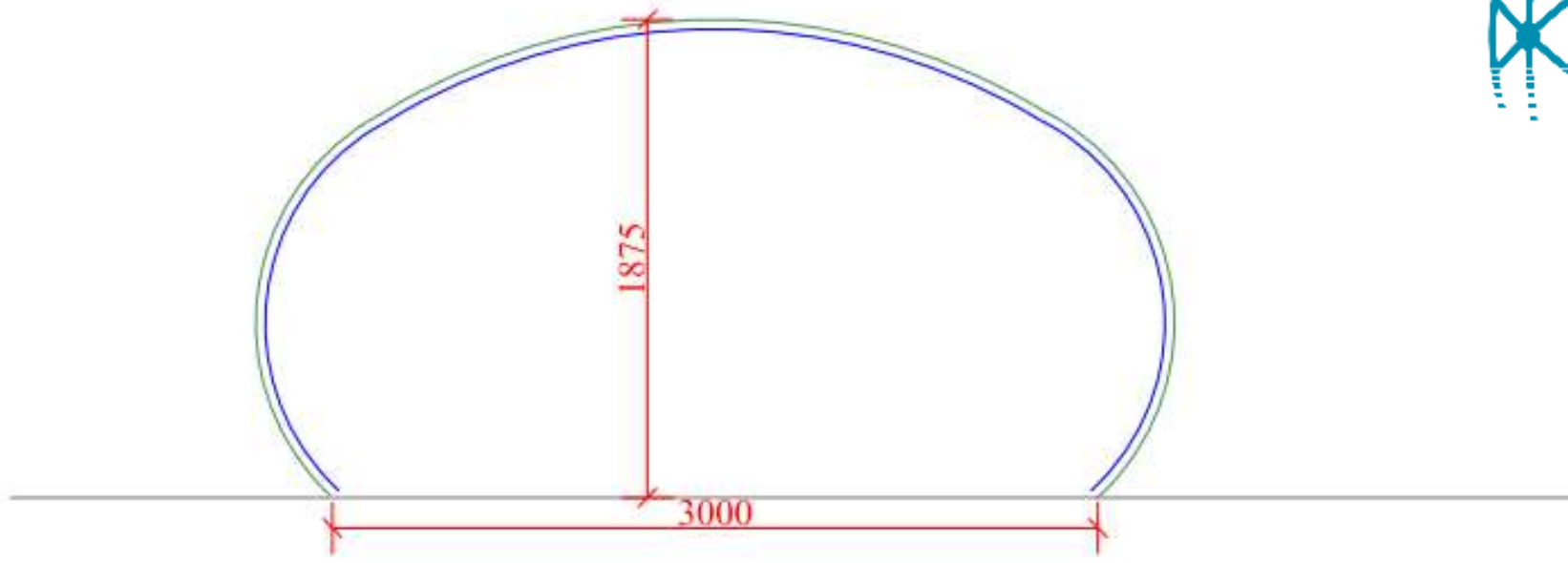
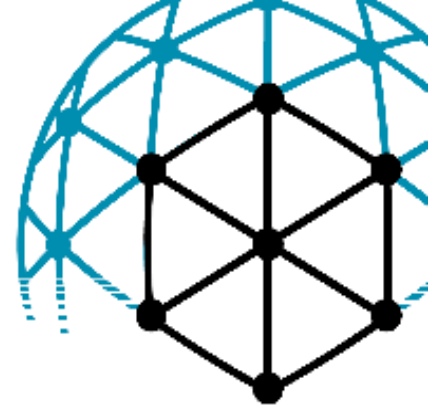




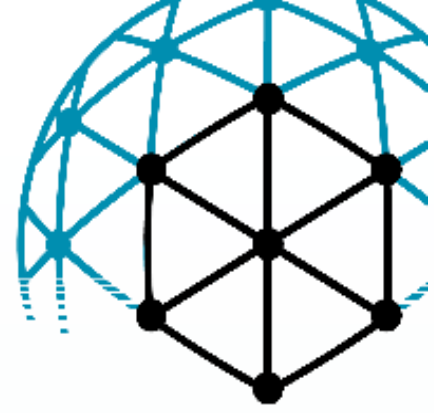












## 1 Introduction

The document is summarize the general specification to assess the design, manufacture and installation of the ETFE cushion for the roof.

This includes layer and material selection for cushion, design criteria, gutter depth, behaviour under load combinations and process description for ETFE Fabrication and Installation.

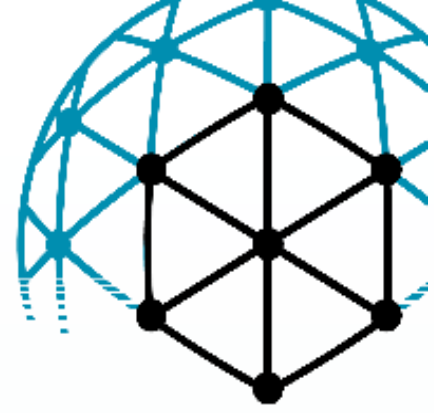


**Figure 1 : System Plan**

To ensure that the final design was engineered with methods consistent with current ETFE design practices, software developed by tension membrane engineers was used. The Membrane system calculated by computer according to Force Density Method. The Rfem software has been used in order to calculate the form of membrane system and statical calculations.

This calculation studies the behavior of the system against load actions as prestress, wind. The load combination and its security factors are defined conform the Eurocode.

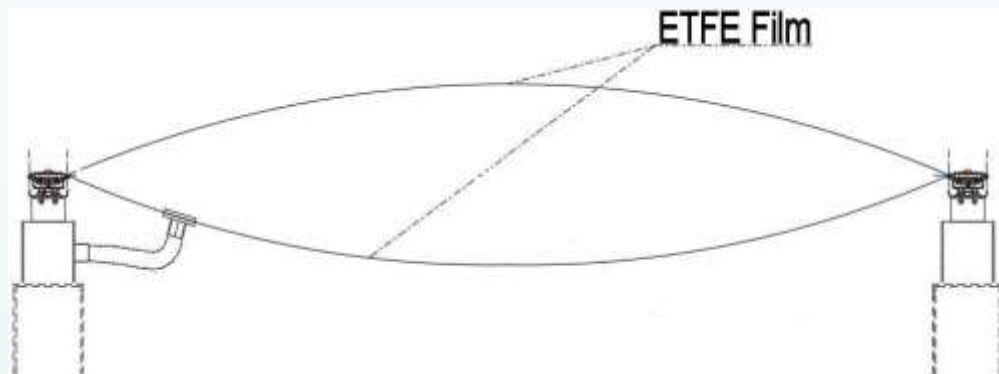




## 2 ETFE Foil Cushion

### 2.1 ETFE Cushion Layer

3 layer cushion , flat middle layer



**Figure 2 : ETFE Foil Configuration**

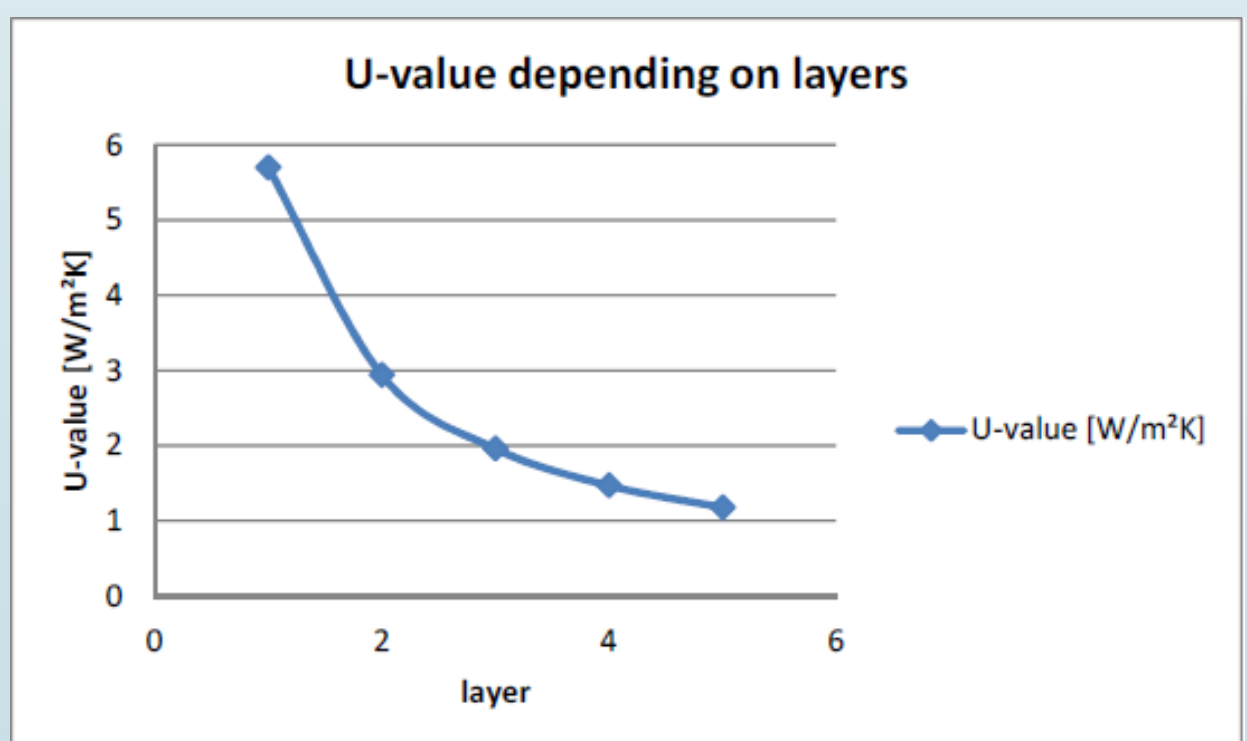
In order to keep temperature difference between inside and outside, we need to decrease U (W/m<sup>2</sup>K) value.

Only effects the U value is layer quantity of ETFE systems. More layer means less U value. (you can see the table below).

The cushions also have the ability to adjust their insulation value by decreasing or increasing the pressure in the cushions, providing thermal adaptability once installed.

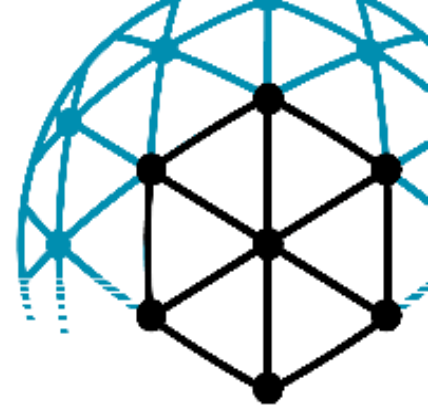
**U-value ETFE layers**

Layers	U-value [W/m <sup>2</sup> K]
1	5,7
2	2,94
3	1,96
4	1,47
5	1,18

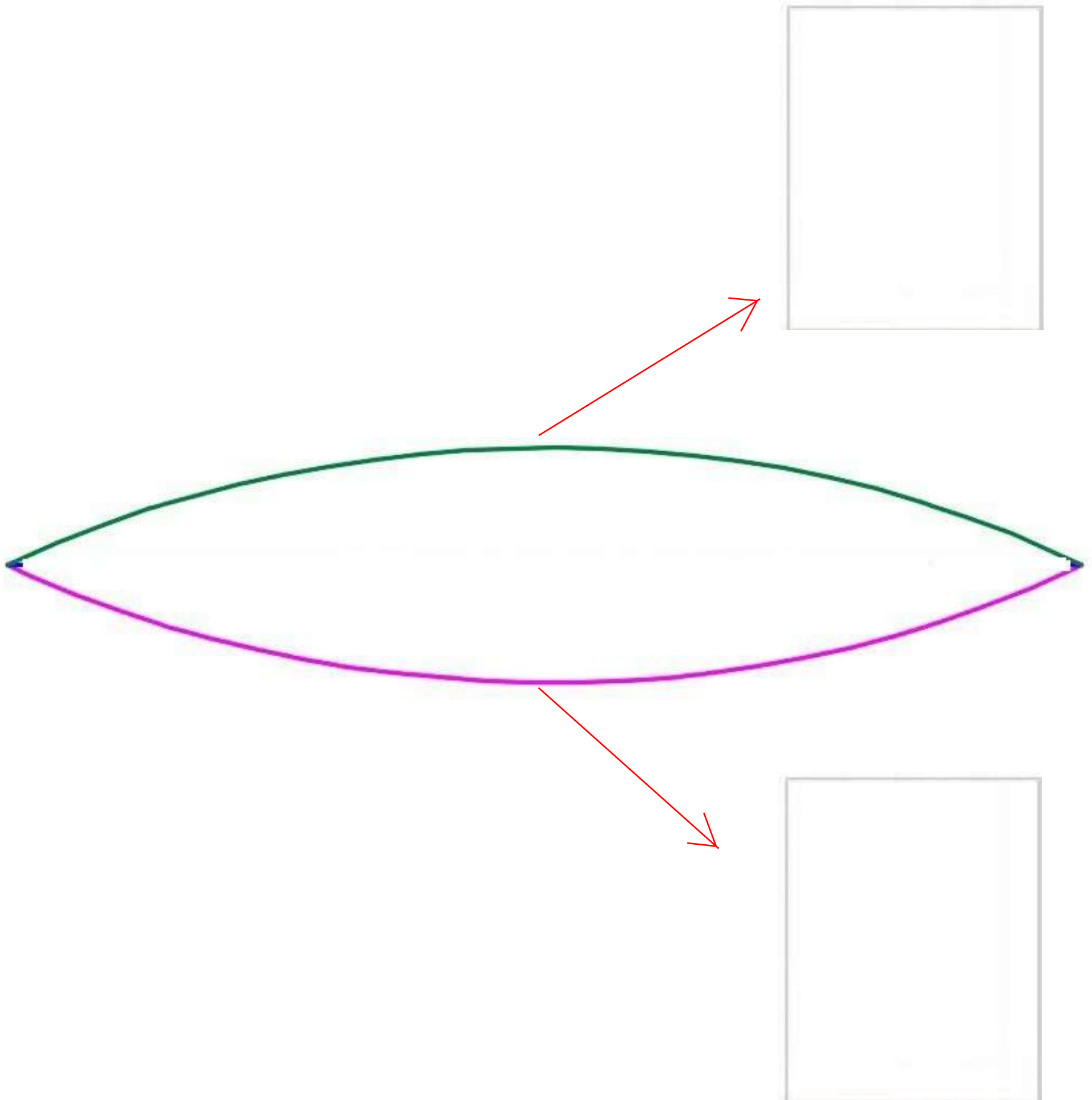


**Figure 3 : Insulation Properties of ETFE**

Any additional requirement can be discussed.

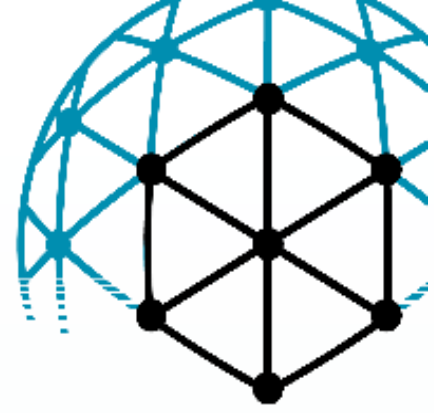


While ETFE has high levels of light transmittance. The upper and lower layers clear  
ETFE foil is chosen.



**Figure 4: Clear ETFE Foil (Lower and middle layer ) Reflective Pattern Printed on  
ETFE Foil (Upper layer)**





## 2.2 ETFE Cushion Material

After loading analysis , it was determined that; The upper layer 300 micron

The lower layer 300 micron was decided to be.

Figure 5 presents the final camber, thickness, and layering of the ETFE cushion.

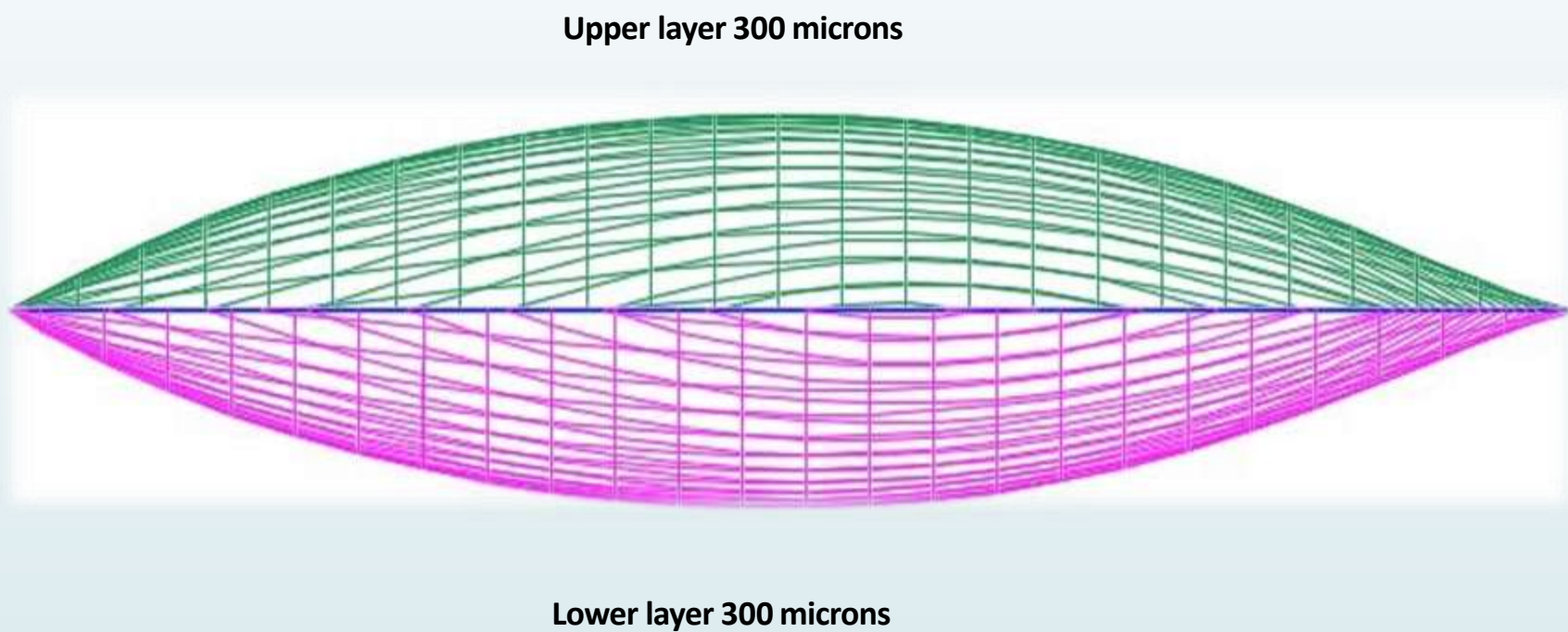


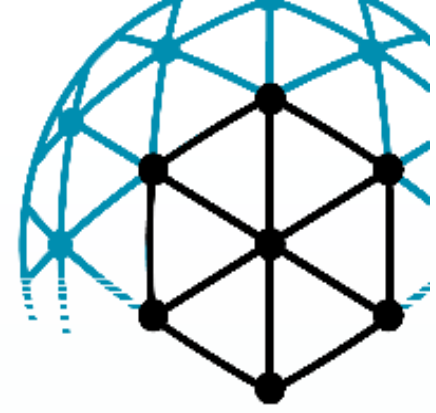
Figure 5 : Front View of Final Cushion

### ETFE:

Foil Thickness : ETFE foil 0,30 mm (Upper and Lower layer)

E Modulus (longitudinal/across) = 700 / 700 kN/m Weight =  
525.0 [g/m<sup>2</sup>]

yield strength:  $f_y = 22,5 \text{ N/mm}^2$

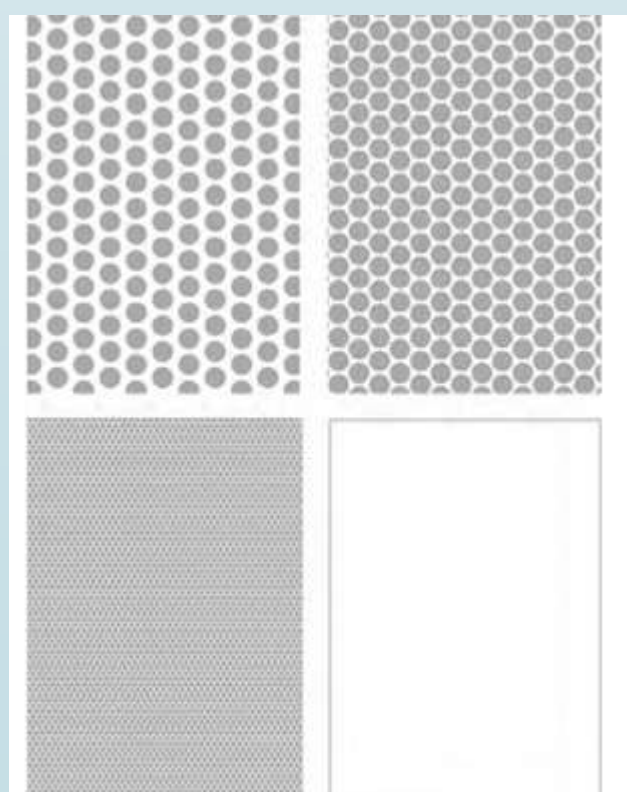


# ETFE SYSTEM

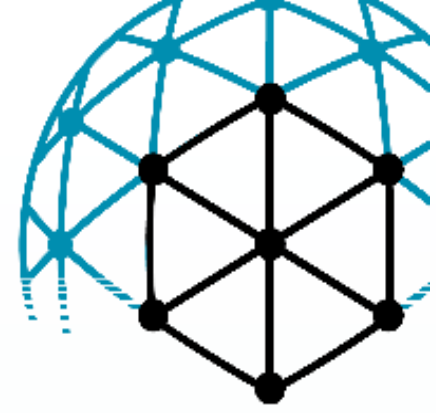
## TECHNICAL INFORMATION

## MATERIAL SPECIFICATIONS

	Test Method	Unit	100	150	200	250	300
Thickness	DIN-53370	um	100 ±	150 ±	200 ±	250 ±	300 ±
Weight	ISO-2286-2	g/m <sup>2</sup>	175 ±	262 ±	350 ±	437 ±	525 ±
Strength	DIN-EN-ISO-527-3	MPa	50 min.	50 min.	50 min.	50 min.	50 min.
Elongation	DIN-EN-ISO-527-3	%	350 min.	350 min.	350 min.	350 min.	350 min.
10% Elongation Strength	DIN-EN-ISO-527-3	MPa	18 min.	18 min.	18 min.	18 min.	18 min.
Tear Strength	DIN-EN-1875-3	N/mm	400 min	400 min	400 min	400 min	400 min
Temperature Strength 150 degree C, 10 Minutes		%	-1 ± 5	-1 ± 5	-1 ± 5	-1 ± 5	-1 ± 5
Light Transmission	DIN-EN-410	%	91 min.	91 min.	89 min.	87 min.	85 min.







### 3 Air Management

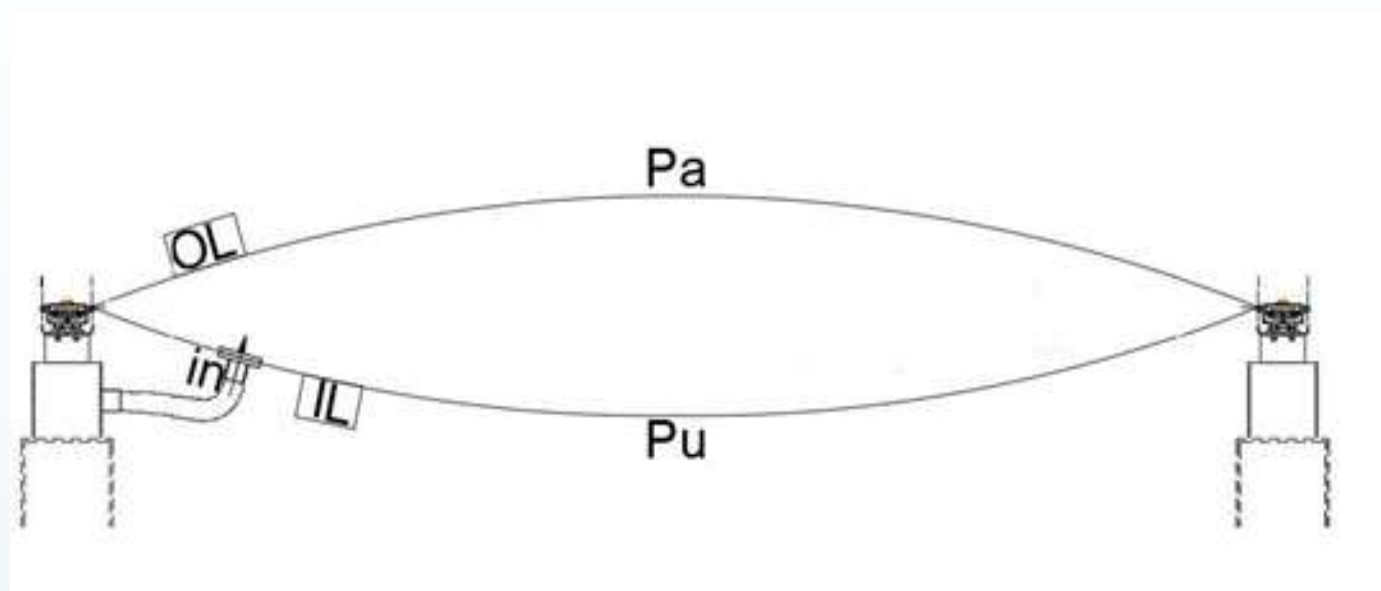


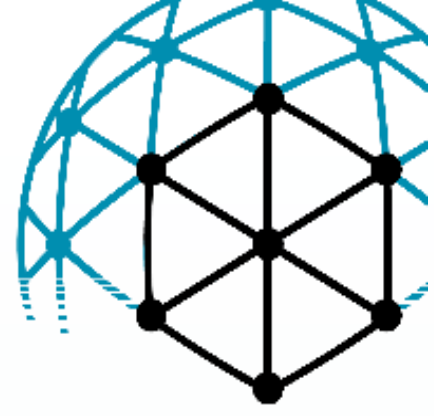
Figure 6 : Front View of Air Management

Air circulation is provided with air pipe connected to the cushion. The foil cushions can be inflated with an air hose and pump system similar to the one in Figure 6. Once the air hose is attached to the cushion it is inflated using a central air pump system that monitors the cushion's internal pressure, temperature, and humidity.

Using cushion sensors the central air pump system also monitors external factors caused by weather such as wind pressures and directions, snow loading, temperature, humidity, and dew point.



Figure 7 : Air Inlet / Air Hose



## 4 Air - Supply

Air supply unit consisting of 2 No. fans (one main one back up), 1 No. dehumidifier and control panel.

The pump system is meant to maintain pressure and not to produce airflow. A single inflation unit can pressurize about 2000 m<sup>2</sup> of ETFE cushions and consists of two backward air foil blowers powered by electric motors.

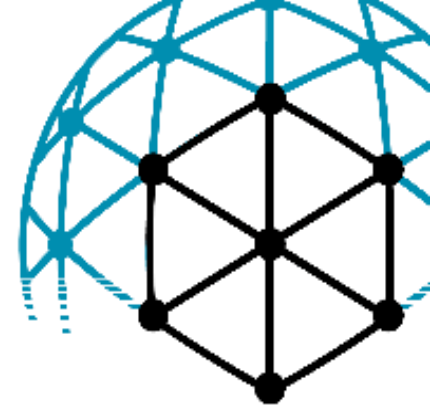


**Figure 8 : Air Supply and Sensors**

Air supply unit Eluft 900 was chosen.

Technical specifications are given on the next page.





Specifications	GREEN Line - best energy ratings for supply air systems				BLUE Line						
	eluft Eco S	eluft Eco M	eluft Eco L	eluft Basic	eluft 150	eluft 400	eluft 600	eluft 900	eluft 1400	eluft Mobile	Temp. Blower
height [mm/inch]	700 / 27.56	800 / 31.5	800 / 31.5	400 / 15.75	400 / 15.75	600 / 23.62	600 / 23.62	600 / 23.62	600 / 23.62	620 / 24.41	270 / 10.63
width [mm/inch]	1650 / 64.96	1750 / 68.9	1850 / 72.83	900 / 35.22	1000 / 39.37	1200 / 47.24	1300 / 51.18	1600 / 62.93	1900 / 74.80	800 / 31.5	600 / 23.62
depth [mm/inch]	700 / 27.56	800 / 31.5	900 / 35.43	700 / 27.56	800 / 23.62	600 / 23.62	600 / 23.62	700 / 27.56	900 / 35.22	600 / 23.62	360 / 14.17
weight [kg/lb]	190 / 418	226 / 498	253 / 558	42 / 93	55 / 121	100 / 220	115 / 253	145 / 320	215 / 474	38 / 84	11 / 24
case material	stainless steel	stainless steel	stainless steel	aluminium powder coated	aluminium powder coated	stainless steel	stainless steel	stainless steel	stainless steel	aluminium	aluminium
voltage	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	230 VAC	400 VAC	400 VAC	230 VAC	115/230 VAC
phase	1	1	1	1	1	1	1	3	3	1	1
frequency [Hz]	50/60	50/60	50/60	50	50/60	50/60	50/60	50/60	50/60	50/60	50/60
average power consumption [kWh/hour]	0.35	0.55	0.9	0.6	0.6	1.2	1.6	2.7	4.9	1.0	0.1
dry air flow rate [m³/h]	--	--	--	80	80	190	275	400	800	190	-
max. air flow as emergency function [m³/h]	380	1200	1800	120	300	800	1200	1800	2800	190	150
max. cushion pressure [Pa]	1200	1200	1200	400	1000	1800	1800	1800	1800	1200	1000
standard duct size [mm]	100	200	200	125	80	100	100	150	200	80	50
noise level dB(A) in 1m	< 53	< 53	< 53	< 55	< 53	< 53	< 53	< 55	< 55	< 53	< 53
application for roof/facade volume [m³]	< 200	< 1200	< 1800	< 50	< 300	< 800	< 1400	< 2000	< 3700	< 300	< 200

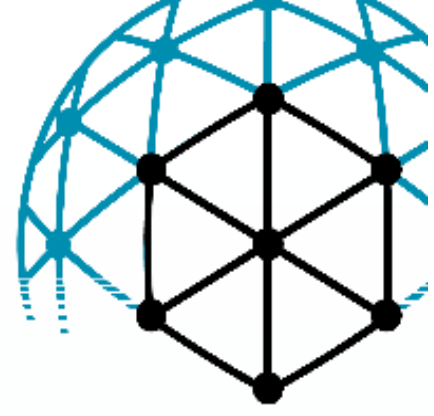
Features (+) and Options (-)	eluft Eco S	eluft Eco M	eluft Eco L	eluft Basic	eluft 150	eluft 400	eluft 600	eluft 900	eluft 1400	eluft Mobile	Temp. Blower
two alternate switched redundant fans	●	●	●	●	●	●	●	●	●	-	-
two frequency controllers for fans	●	●	●	-	●	-	●	●	●	● 3)	-
single fan for permanent air circulation	●	●	●	-	-	-	-	-	-	-	-
programmable controller	●	●	●	●	●	●	●	●	●	●	- 4)
internal display for status and settings	○	○	○	- 1)	○	○	○	○	○	○	-
Wireless Access Point	○	○	○	-	○	○	○	○	○	○	-
external graphical touch display for status + settings (LAN cable up to 100m)	○	○	○	-	○	○	○	○	○	○	-
WEB Server	○	○	○	-	○	○	○	○	○	○	-
master control system	○	○	○	-	○	○	○	○	○	○	-
5 status signals (contacts) for BMS	●	●	●	● 2)	●	●	●	●	●	●	-
shading option	-	-	-	-	-	-	-	-	-	-	-
intake air filter cassette G4	●	●	●	●	●	●	●	●	●	●	-
intake air fine filter cassette M5	○	○	○	○	○	○	○	○	○	○	-
intake air fine filter cassette F7	○	○	○	○	○	○	○	○	○	○	-
analogue pressure sensor	●	●	●	-	●	●	●	●	●	●	-
safety MIN-pressure sensor	●	●	●	-	○	○	○	○	○	○	-
safety MAX-pressure sensor	●	●	●	-	○	○	○	○	○	○	-
snow scales / sand scales	○	○	○	-	○	○	○	○	○	○	-
proportional snow height sensor	○	○	○	- 1)	○	○	○	○	○	○	-
snow detection sensor	○	○	○	- 1)	○	○	○	○	○	○	-
110/115V 60Hz conversion	○	○	○	-	○	○	○	○	○	○	●
hygrostat for power minimizing	○	○	○	-	-	-	-	-	-	-	-
autom. dual power source switch	○	○	○	○	○	○	○	○	○	○	-
wind speed sensor	○	○	○	○	○	○	○	○	○	○	-
SMS alert interface	○	○	○	-	○	○	○	○	○	○	-
leg extensions (500mm for high snow areas)	-	-	-	-	○	○	○	○	○	○	-
eluft T version with 2 front doors	-	-	-	-	○	○	○	-	-	-	-

● standard feature / ○ optional / -- not available

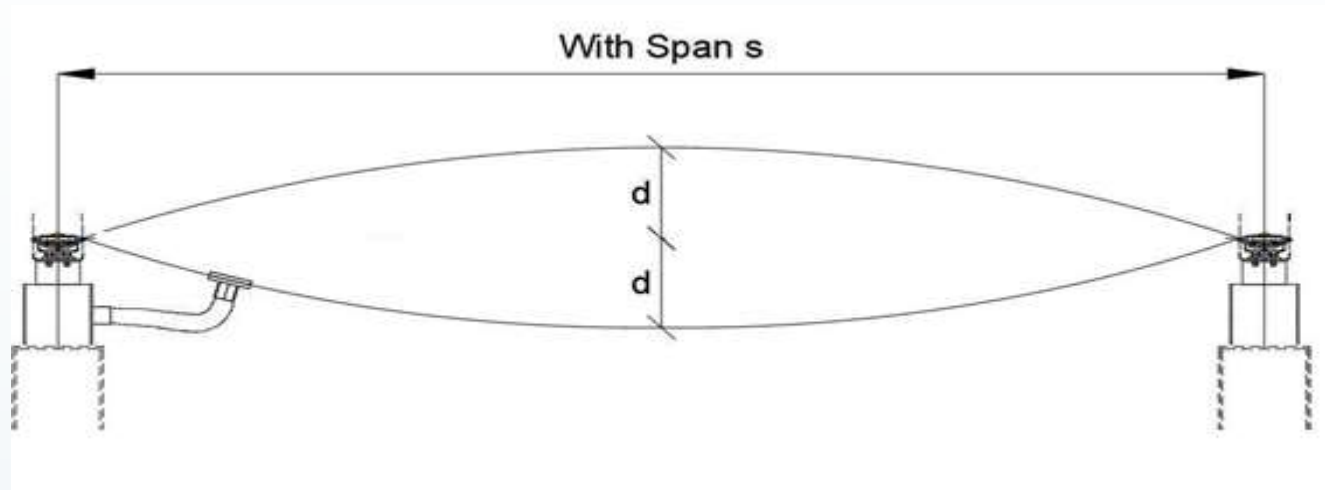
1) switch for summer/winter mode 2) 2x contact (signal) 3) one frequency converter 4) potentiometer

Average power consumption values are based on moderate climate conditions typical of Central Europe and will vary internationally. Application dimensions (m³) are based on dry air throughput for systems with leakage of app. 5-10% and app. 2 full air cycles per day. All machines are CE certified. Additional international approvals such as UL certification can be provided.





## 5 System Connection Details



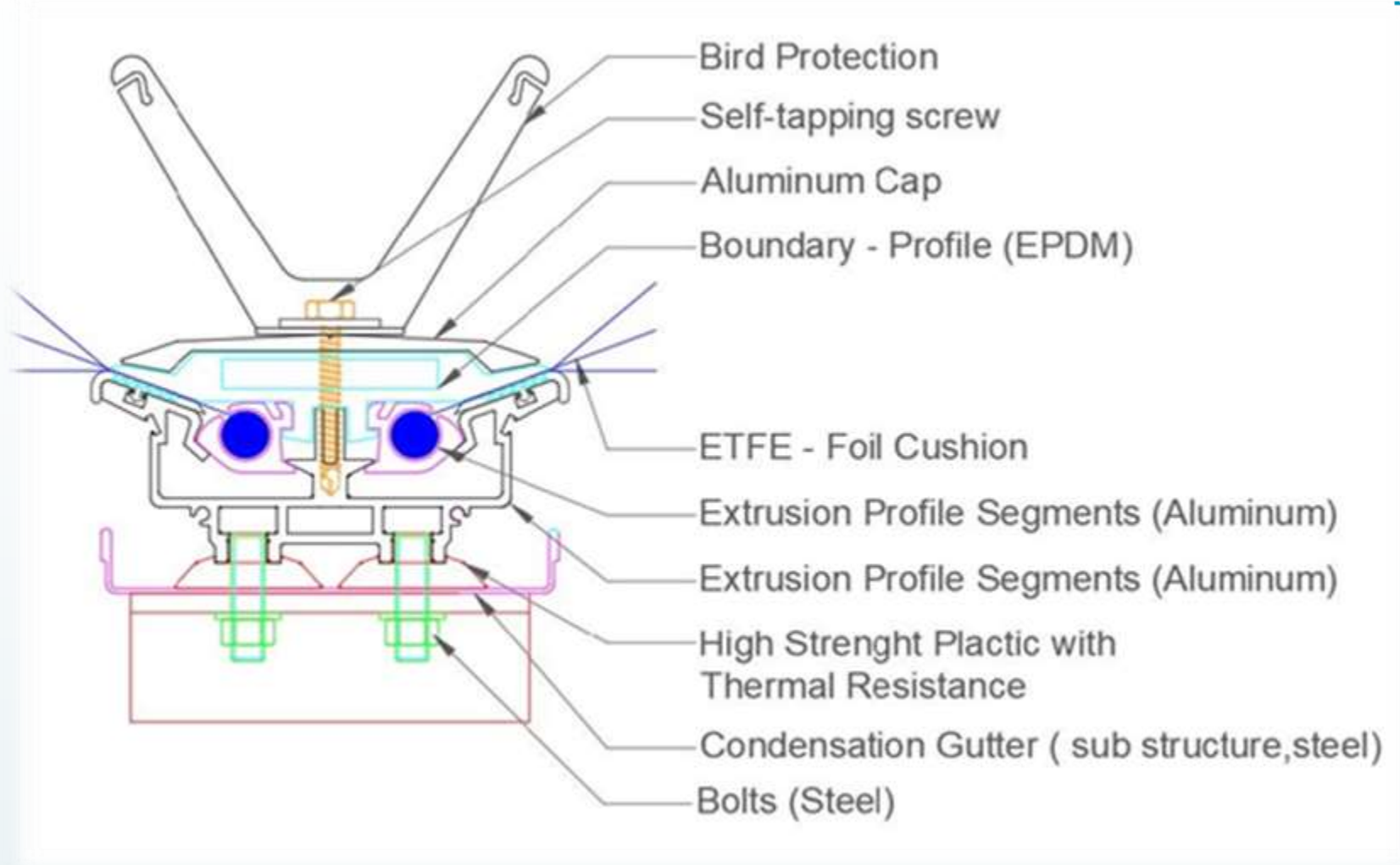
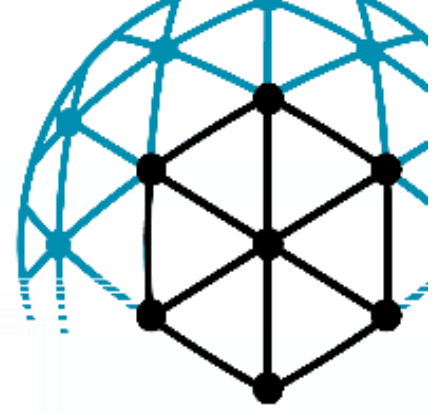
**Figure 9: Connections of ETFE Cushions to Support Frame**

ETFE cushions, mounted on the carrier structure with special upgrading apparatus is fixed to the aluminium prof. The inside or outside of the vent pipe connected to the pressure set on cushion airflow upgrade and apparatus are provided to receive the forms prescribed inflatable cushion is provided.

The cushion rise is approximately 12.5% of the span.

### 5.1 Flexible Aluminium Extrusion Profiles

All aluminum profiles will be installed at the edge of the ETFE cushions by using thermal separator in between the steel gutter and the profile. These separator will prevent the drifting of the connection and letting the water to the downside due to thermal differences.



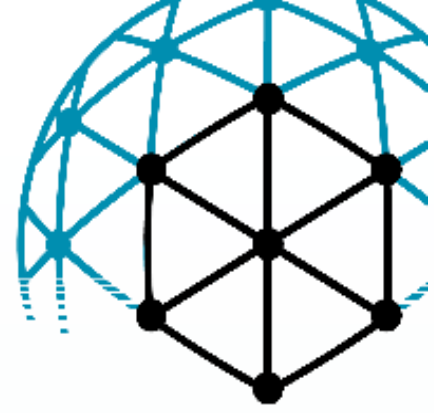
**Figure 10: Aluminium Extrusion Profile**



**Figure 11: Thermal Separator**

After the ETFE holder aluminums locked(as seen in the figure 10) in to the main aluminum profile (as seen in the figure 11), aluminum pressure plate will be placed and stabilized onto the connection system and lock it against the water entrance.





## 5.2 Welded ETFE -Seam

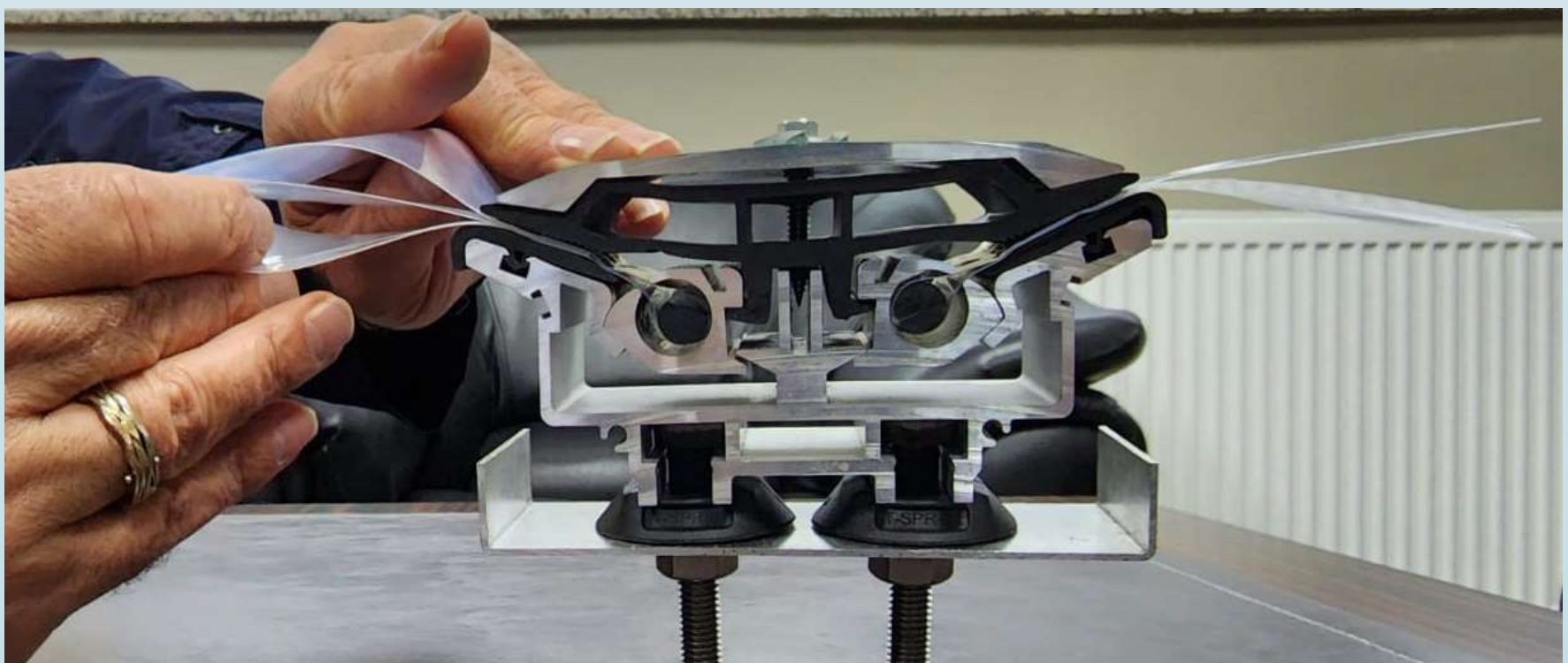
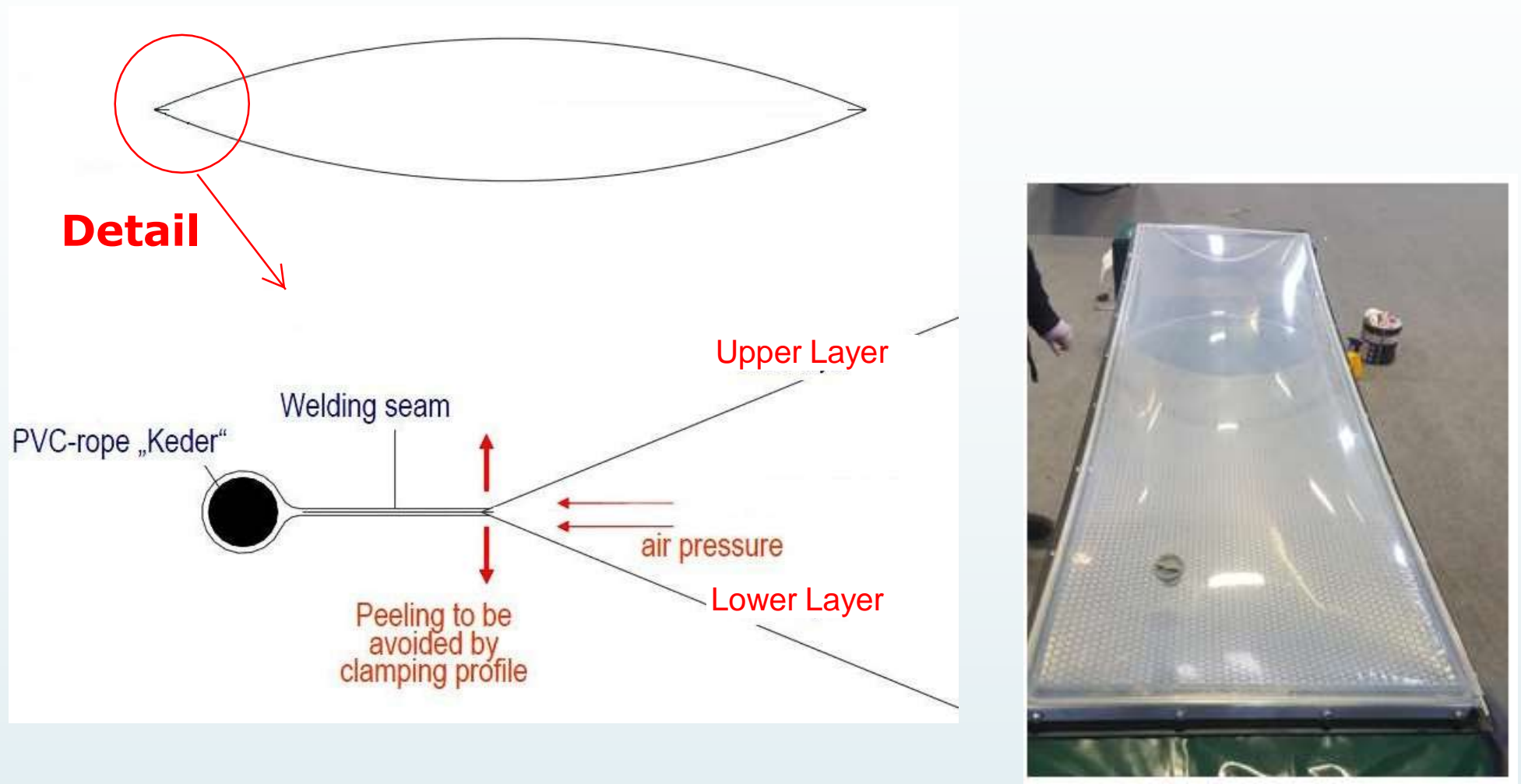
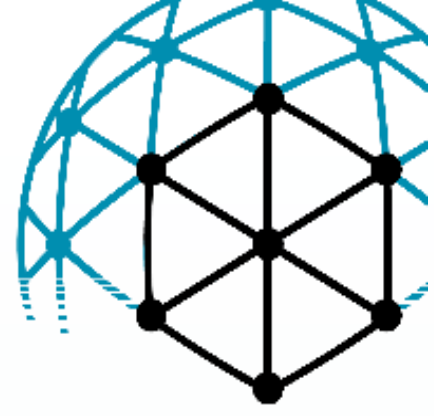
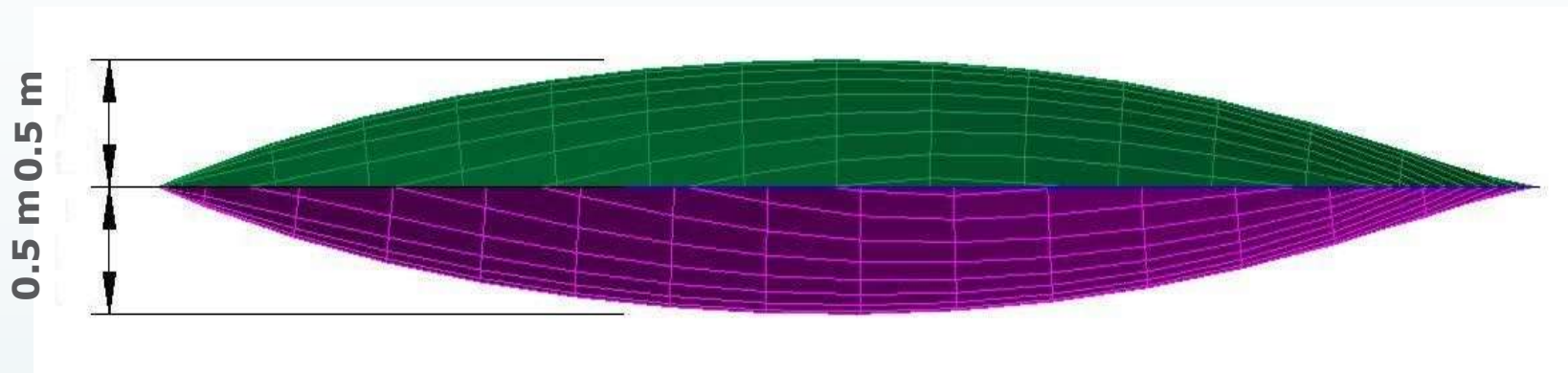


Figure 12: Welded seam (continuiuos-method)



## 6 Design Basics

The geometry of the building is determined as rectangular. In this calculation, sample modules selected from the fields shown below are taken into account.



**Figure 13: Sample Module Considered For Design**

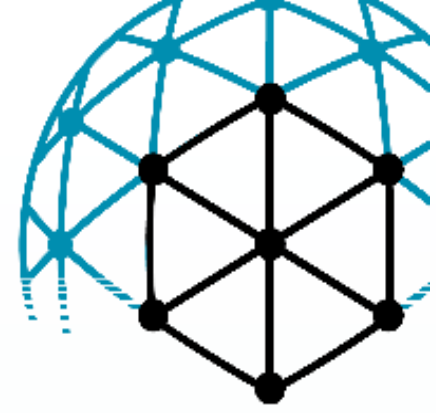
### 6.1 Loads

The etfe cushions will be subjected to both snow loads and wind loads.

Load Type	Load Value
Pre-stress (PS)	Internal pressure $P_{u,i}$ = 0.30 kPa
Wind Up (Wu)	1.00 kN/m <sup>2</sup>
Wind Down (Wd)	-1.00 kN/m <sup>2</sup>

The results have been given for each of the loads.





# 7 Result

## 7.1 ETFE Foil

### 7.1.1 Resistance capacity

The resistance capacity is determined as the characteristic yield strength  $f_y$  divided by the product of all security factors  $[A_{mod}]$ .

$$R_{d\ SLS} = f_y / \gamma_m * A_0 * A_1 * A_2 * A_3 * A_4$$

### 7.1.2 Safety factors

The definition of security factors and the product of all security factors for the long and short loading are given below:

Security factors ( $\gamma_m, A_0 - A_4$ ) and total security factors (A)

		Permanent	Long-term	Short-term
$\gamma_m$	partial safety factor material	1.10	1.10	1.10
$A_0$	biaxial stress	1.20	1.20	1.20
$A_1$	long-time loading	1.80	1.30	1.00
$A_2$	influence environment	1.10	1.10	1.10
$A_3$	influence high temperature	1.20	1.00	1.10
$A_4$	imprecision of fabrication	1.00	1.00	1.00
$A_{mod, 23^\circ}$	total partial safety factor	3.14	1.89	1.60

Reference : Tensinet Design Guide Annex 5

### 7.1.3 Resistance capacity

#### ETFE Foil 0,30mm

Tensile strength:  $22.5 \text{ N/mm}^2 \cdot 0.30 \text{ mm} = 6.75 \text{ N/mm} = 6.75 \text{ kN/m}$

- for pre-stress  $R_{d} = 6.75 / 3.14 = 2.15 \text{ kN/m}$

- for wind  $R_{d} = 6.75 / 1.60 = 4.22 \text{ kN/m}$



# 8 ETFE MANUFACTURING PROCESS

## CNC CUTTING PREPARATION



For the cutting of the formats which are delivered by the shape and the pneumatic stress qualities to be connected, ETFE movies are laid as per the cnc machine.

## POCKET WELDING



The ETFE film (single-wall applications) edge halatlar Tallinn to pass for widely held cell paste operation.

## BONDING



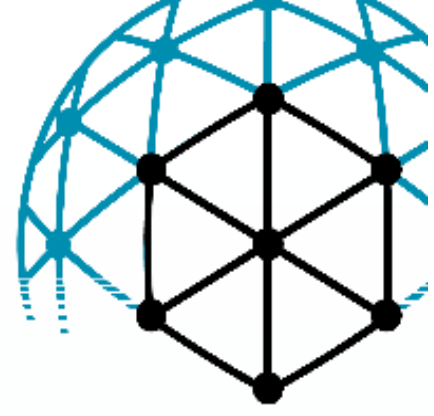
Middle of the road holding is done by the shares given in the interfered with formats. The parts are stuck all together as indicated by the layout numbers and the

## PACKING AND SHIPMENT



The risk of fracture and tear Material minimum to download then labeled and packaged in the form of folding module ID will not be lost on them in a way of sorting and dispatch are provided with maximum security.





# MECHANICAL WORKS

**ELUFT  
AND  
ELUFT ECO SERIES  
AIR SUPPLY SYSTEMS**



**eluft**

**ELUFT AND ELUFT ECO SERIES  
STATE OF THE ART AIR SUPPLY SYSTEMS  
FOR USE IN INFLATED STRUCTURES  
EMPLOYED IN ROOF AND FAÇADE APPLICATIONS**



elnic

Supply Air?  
Let us take control... individually!





## eluft basic / 150 / 400 / 600 / 900 / 1400 – Blue line

elnic's initial eluft Series has undergone continuous improvements since its first release in 2000. The basic eluft units are available in six setups to match the demand of the individual applications. A single eluft unit provides clean and dry air for roof and façade applications of up to 3700m<sup>3</sup>. Individual combinations of several eluft units match the request for larger projects.

The eluft unit includes three main integrated components:

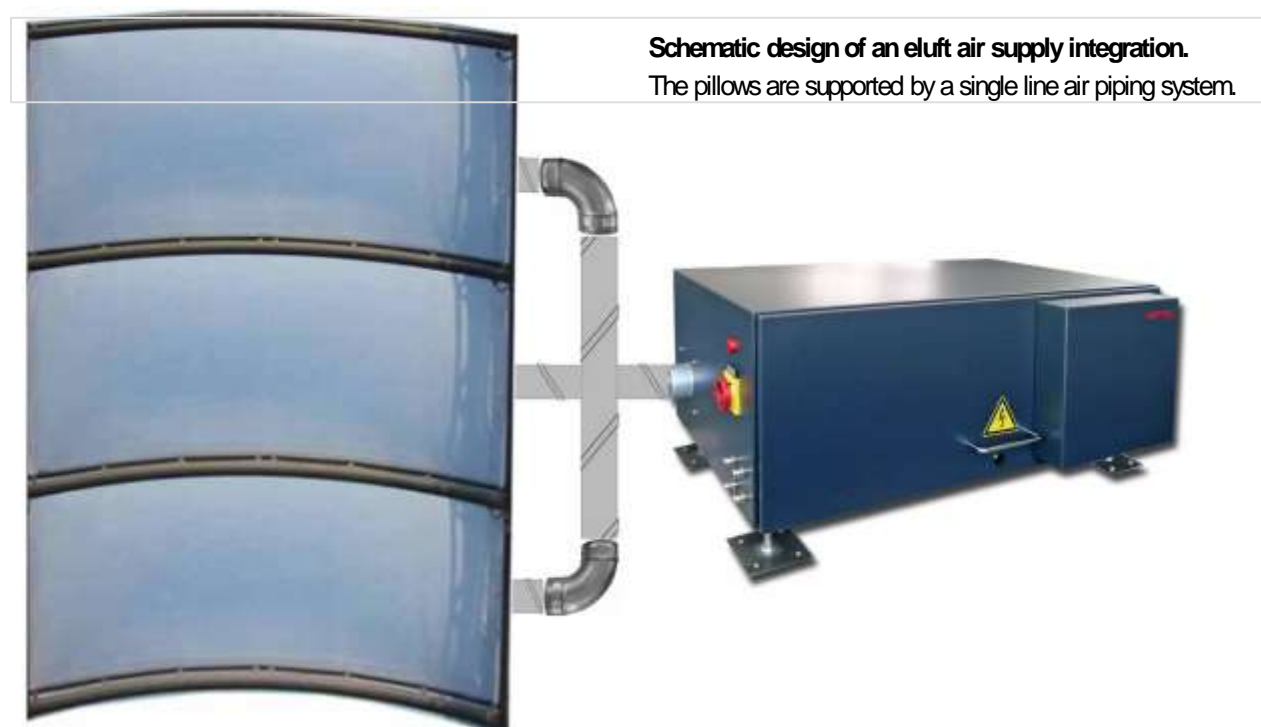
- Dehumidification of air using an adsorption dehumidifier.
- Compression of air using two redundant fans.
- A switchboard with a programmable computer unit and prepared interface sockets for various devices and the standard sensors (min./max. and analog pressure) (except eluft 150 + basic).

The redundant fans automatically switch over every 9 hours. If one fan should malfunction, the second fan immediately takes over, an alarm lamp illuminates and an alarm signal is sent by the control unit. For initial inflation and in case of high leakage due to a damaged pillow or other special circumstances, both fans can automatically be operated in parallel.

The adsorption dehumidifier operates so that any humidity is released in a warm air stream, which exits at the side of the eluft case. No condensation fluid of the dehumidifier can escape from the unit.

The programmable computer control located inside each unit provides a basic display (not in eluft basic) and editing function for initial setup and maintenance purposes. Five free contacts provide alert messages for connections to BMS interfaces.

By using additional components including control valves and additional fan units, the eluft system can be upgraded to move a flexible middle layer inside the pillow, which then causes shade.



## eluft ECO S / M / L – Green line

eluft **ECO** Series is a further development of the basic eluft series. The eluft **ECO** series has been designed to respond to the increasing demand for reduced energy consuming devices. eluft **ECO** is the solution for building energy-efficiently as required in classification such as „LEED“ or „BREEAM“. A single eluft **ECO** unit provides air for applications up to 1800m<sup>3</sup>. Three different sizes are available either as a single unit or multiple unit configurations.

By adding a return path for the dried air, a closed circuit system is created and maintained by the eluft **ECO** system. Only sufficient external air needed to cover leakage (air escaping from the pillows and piping system) is ever added to the closed circuit once the pillows have been fully inflated. Dried air is permanently circulated by an additional fan unit across all areas of the circuit to avoid any possibility of condensation. A humidistat permanently controls the humidity inside the closed air circuit and only turns on the dehumidifier when necessary. Since the dehumidifier consumes the most power in an air supply system, the reduced demand for air drying substantially lowers the overall power consumption of the system, in some cases by up to 70%.

Similar to the basic eluft unit, the eluft **ECO** includes the three main integrated components, i.e. redundant fans, a dehumidifier and a switchboard. However, there are three major differences between the basic eluft series and the eluft **ECO** units. The eluft **ECO** incorporates:

- Large additional overpressure case integrated into the unit.
- Dehumidification of air by a condenser dryer occurs inside the overpressure case.
- An additional circulation fan is installed inside the overpressure case.

Condensed water is collected inside the overpressure case and released on demand by an additional pump. The water is released via an outlet pipe.

Other features and options are similar to the eluft blue line.





## eluft Mobile

elnic's mobile air supply unit "eluft Mobile" was designed as a temporary air supply source on construction sites, for mock-ups and research & development projects.

The "eluft Mobile" provides filtered and dried air for pillows of up to 300 m<sup>3</sup> and pressures up to 1,200 Pascal. An integrated programmable computer-controlled system with display and controls allows precise set-up and control of the system parameters. A current pressure sensor guarantees the exact needed pressure.



The system is designed and built for reliable operation in temporary projects. As the eluft mobile does not have a second redundant fan unit it should not be applied as permanent air supply solution.

## elnic's supporting blower



elnic's air supply unit "supporting blower" is designed for the use at mock-ups, or as a temporary supply air source on construction sites.

The device provides filtered air for cushions of up to 200 m<sup>3</sup> and pressures up to 1,000 Pascal. The volume output can be adjusted by an internal control dial. The air is not dried by the supporting blower as there is no dehumidifier inside.

It can be connected to different currents (110V/240V 50/60Hz) by using the related cable set.

## Optional Devices

Individual application designs such as two, three or four layer pillows combined with the different unique environmental circumstances of the individual locations require advanced system combinations. Therefore all elnic eluft and eluft ECO devices are designed to be supplemented by optional features to meet the most appropriate demands. This allows configuration matching the most economical and ecological solution for the project.

For the individual configuration and layout of eluft and eluft ECO units as well as connected components the specialized elnic Engineers are pleased to assist you.

## Master Control Unit

The master control unit provides superior controlling for complex systems where several eluft and/or eluft ECO devices are combined.

The master control unit is an individual switch board cabinet equipped with a programmable logic controller, a touch screen for editing and visualization and interfaces for connection to eluft and eluft ECO devices as well as all applicable sensors, valves, etc.

The master control communicates via Ethernet among the devices with *Network Feature*. The integrated display can also be complemented by an additional *External Touch Screen Terminal* for placement in remote locations such as control rooms, etc.

The master control system can also perform system functions such as controlling electrical flaps or monitoring the air flow. Like all elufts it may be enhanced by a WAP and/or SMS and email.

Only the MCU offers the BACNet interface as an add-on to exchange live data with any Building Management System.



## Network feature

Each eluft and eluft ECO device can be supplemented by an Ethernet network module which allows communication between the systems as well as to a *Master Control* unit. Weather sensors and certain BMS systems can also be linked to the network. For long distances repeaters can modulate the signal in a way that nearly no length restrictions exist for the network. Remote access is also available.



## Optional Devices

### Wireless Access Point

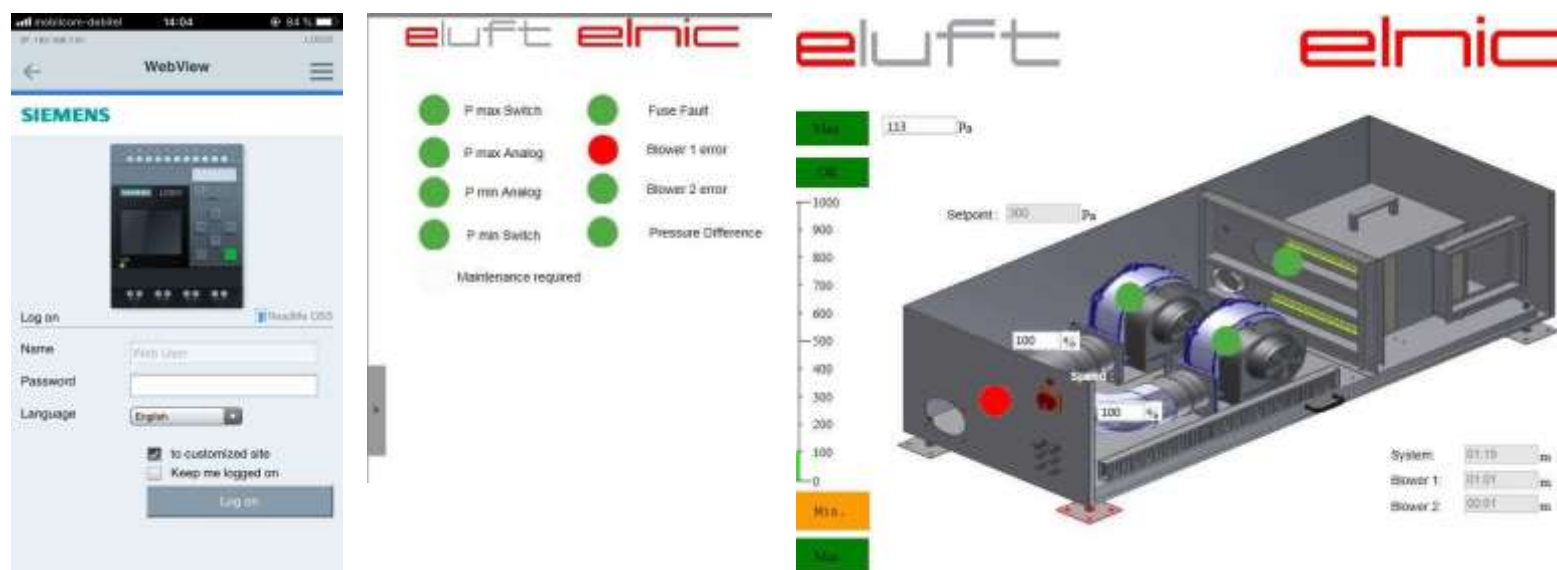


The standard eluft systems (150-1400, ECO) can be connected via a LAN port in the control unit to a wireless access point. This AP is weather resistant and attached to the outside of the eluft station. Within the transmission range devices which are capable of wireless reception (e.g. smart phone, tablet or notebook) can dial into the eluft (password restricted) and show the contents of the internal display on the device. The user can control and administer the eluft. If the wireless access point is connected to a Master Control Unit, the same data can be displayed locally as described under remote access feature.



### Webserver control

The Webserver Software enables the user to view data from the logic controller inside the air machine on a LAN-connected appliance such as a smart phone/tablet/PC, displayed in a graphical, professional man-machine interface (MMI). It not only offers access to the standard PLC interface but also shows real-time data, diagnose pages and errors in a customized site. Combined with the WAP, the air machine PLC can be accessed by WIFI.



### BMS signal interface

As a standard, each eluft and eluft ECO system is equipped with a socket, which provides five contacts (dry contacts) for connection to building management systems. The signals can be dedicated to various status and failure messages.

A master control unit has four potential-free contacts for each connected eluft. It may be extended by a BACNet Interface to exchange live data with the BMS.

## Optional Devices

### Remote Access Feature

This feature allows worldwide remote access to the operation display of the Master Control system via modem. A regular PC with modem connection and an elnic software application acts as extended screen and allows displaying any information in parallel, provided by the Control Panel. Local technical assistance is made easy by the possibility to check all operation, failure and preset parameters from specialists of the membrane suppliers. In order to be able to use this feature, the unit needs to have a master control system and internet access.



### SMS and email alert interface

An optional integrated SMS or email module can send an alert message to several designated phones and/or email addresses at any time to inform operators and maintenance personnel about the system status or to provide alert messages.



### Humidity switch – ECO package

In combination with the eluft blue line machines the use of a humidity switch provides an additional energy saving opportunity. The humidity switch measures relative humidity and acts as a digital switch when the pre-set value is reached. Based on this signal, the adsorption dehumidifier turns off the heater of regenerating air, which is the most power-consuming element in the air supply system. The efficiency of this feature is dependent on local environmental conditions, which considered in the design of the system. The humidity switch is included as standard in our bigger eluft machines and all green line ECO machines.



### Air filter cassettes

Atmospheric pollution can harm certain elements of the eluft and eluft ECO air supply system and can result in fogging and unsightly air contamination inside of the pillows. An air filter cassette is installed behind a protective cover of each eluft unit to filter air entering the system. The G4 filter (normal air pollution) is installed in a slot designed for easy exchange during maintenance. For certain regions, the filter can be replaced by fine filters with increased filter capacity. All filters have to undergo



at least a half-yearly inspection and need to be replaced, if necessary even more often. The different filter classes are available in the same size.

### Snow Sensors

Three types of snow sensors are available: *snow detection*, *snow height* sensors and *snow scales*. All types can be connected either to a single eluft or eluft **ECO** unit or to a superior master unit which controls several eluft devices.

Basic snow detection sensors can judge between the presence or absence of snow and provide a digital signal. This signal is transformed into a preset increase of pressure to resist against snow load. The advanced snow height sensor allows the eluft or Master control unit to adjust the throughput of air steplessly variable from normal to the maximum preset level. Variable air throughput brings important benefits to the overall system. It does not need to operate with the maximum preset throughput of air, which may cause noise to develop in the piping and cause the dispersion of wet air through the system for a certain time period. This gentle way of raising and lowering the pressure in the pillows also reduces stress in the welded seams of the pillows and in the supporting structure. The high end snow scales take into account the snow height and weight so the eluft can react differently on heavy wet snow or powder snow even if both have the same height.

#### Snow detection sensor

The snow detection sensor provides a digital signal to the control unit when humidity appears on the sensor. The control unit increases the air throughput to the maximum preset level to resist against snow loads if in addition the integrated temperature sensor shows a value less than 3°C. The use of the snow detection sensor should only be applied for pillows where the maximum preset pressure is quite comfortable within the limits of the pillow statics.

It is not recommended to use this sensor in areas of high snow loads and long periods of dry weather.



#### Snow height sensor

The elnic snow height sensor exactly measures the height of accumulated snow between 1 and 80 cm and is resistant to failure under misty or rainy conditions.

The measured height shows on the display and is sent to the eluft or Master unit as an analogue value. The elnic controls transform the snow height value received from the sensor into a required pressure which it establishes as the automatic default for the connected air pressure unit(s). The preset supporting air pressures are steplessly increased by the power-regulated fans.



#### Snow scales



The elnic snow scales consist of a measuring unit and a connection to the eluft machine, which processes the data in its controller. The system works completely self-sufficient. The exact weight is determined with just one load cell. They can also detect snow drifts thanks to the open grid construction. The measured snow loads are converted by the eluft into pressure, proportionally.

#### Wind sensor



Based on the dimensions and structural design of the pillows a few applications require the increase of internal supporting pressure under heavy wind loads. The wind sensor provides permanent information on wind speed to the control unit, which adjusts the necessary pressure based on preset parameters. The data from the sensors is monitored by the controls in such a way that short wind gusts do not create a demand for higher pressure.

For winter operation the wind sensor is equipped with a heater. All bearings and screws are made out of stainless steel. Working principle of the wind sensor see FAQs.



## Optional Devices

### Automatic switch for dual power source connection

Some projects require the connection of air supply units to two different power sources where one power source serves as a backup function. This might involve the connection to two different transformers feeding the building or the connection to a regular power source and an emergency generator. If two power sources are to be connected to an eluft or eluft ECO system an additional “dual power source switch” can be applied.

### eluft with UPS

eluft machines may be ordered with an own Uninterruptible Power Supply. The UPS is made to order and adapted to the eluft. In case of emergency mode the UPS only keeps the pressure level constant in order to bridge the period of power failure as long as possible.

The bottom casing contains the UPS, which is connected to the eluft in the corresponding casing on top.



### eluft with 110/115V – 50/60Hz

eluft machines can now be bought with an additional device to be able to connect the eluft to 110/115V – 50/60Hz power supply. It is an option for the complete range of ECO machines (green line) as well as for the elufts 150,

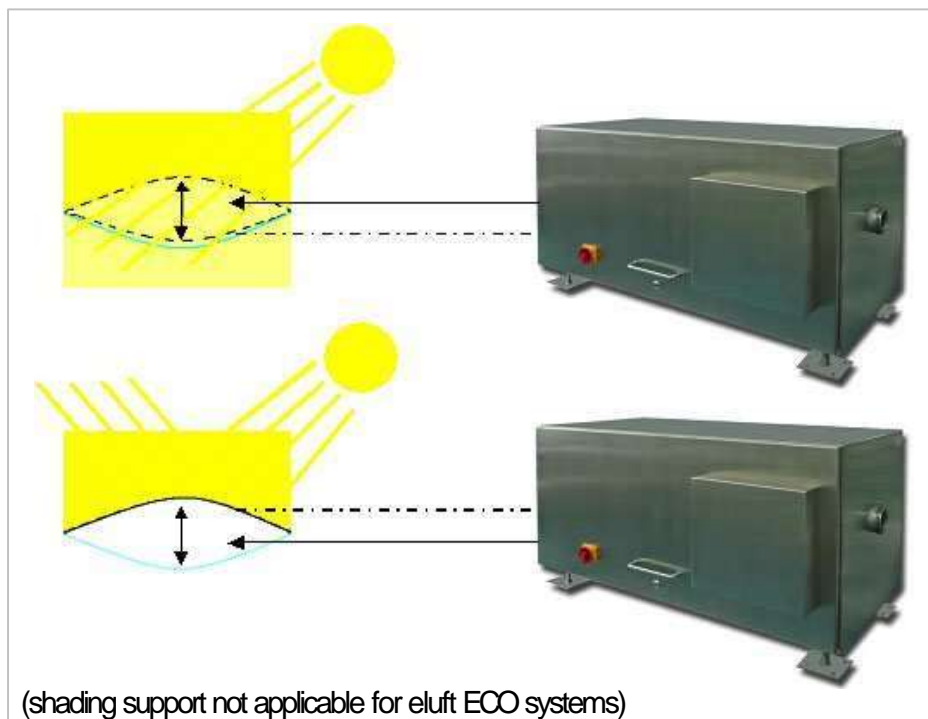
400 and 600 of our blue line machines. This is also an option for the UL versions.

**NEW**

### Shading support

Several projects require a middle layer, which can swing up or down to provide shading by the overlapping of printed patterns. An intelligent combination of valves and pipes inside the eluft can change between inflation of the upper or lower pillow chamber of three layer pillows. Therefore a second pipe is required as shown in the sketch. To ensure a fast and ecological procedure, the system creates a closed circuit for a short time and circulates the dry air from one chamber of the pillow into the other one, e.g. from top to bottom chamber.

The shading controls are integrated in the eluft unit and make sure that the air needed to move the middle layer



(shading support not applicable for eluft ECO systems)

is taken from the chamber which becomes free from air. As the air flowing to shade the pillows does not need to be dried, it becomes more energy-efficient.

It is possible to connect a light sensor to the air machine, which sends a signal to open or close the shading. This is all done automatically.



## FAQ and Answers

### ***How do I arrange the layout for the pipe dimensions?***

Pipe dimensions depend on the length of the pipes, the number of pillows and the number of bends in the pipe. All elements cause resistance for the airflow. To achieve a proper rate of necessary air exchange (for dry air input) a resistance calculation with a specialized software should always be required. elnic is pleased to provide further support in pipe dimensioning based on your individual project data.

### ***Why are main pipe dimensions for elnic systems smaller than from competitive suppliers?***

All eluft and eluft ECO systems contain frequency controlled fans. Conventional fans with only digital (on/off) operation bring either 0% or 100% throughput into the piping system. To track those masses of air volume the pipe dimensions have to be designed accordingly. This might bring the requirement for pipes with dimensions of 50 and more percent of diameter according to the pipes used for elnic systems.

### ***Is dehumidification really necessary?***

Standard central European climate conditions show notable differences in humidity and air temperature. Those values might also change within a short timeframe. Those changes have an impact on the dew point, which might be located on surfaces inside the pillows. Once the dew point is reached a certain amount of condensation water might appear inside the pillow. If this water is not dried by dehumidified air, it will remain in the pillow and create algae. In central European winter times or in areas with general low humidity the control system can reduce the operation of the dehumidifier. In order to achieve a proper drying effect under high humidity, the throughput of dehumidified air should reach approximately 2 full air cycles per day in the system.

### ***When can I expect an amortization of the additional cost for the ECO series in comparison with the basic eluft series?***

In addition to the price difference between the eluft ECO and basic eluft system, the cost for the return pipes have to be considered in the amortization calculation. Based on the experience with recent projects, the amortization period is approximately 3 to 6 years. For systems with an expected lifecycle of more than 20 years the ECO systems will bring a great benefit to the clients. elnic gladly assists you in those calculations.

### ***What is your standard product warranty?***

Our standard product warranty is 12 months on moving parts and there is a 24 month "Bring in" warranty. In case some part breaks down, we can try and solve this over the phone to find out exactly what is broken and what would need to be replaced. elnic is then able to send you a spare part, you would not need to bring in the whole machine. In case a part needs to be repaired, again, the part should be sent to us and elnic can have it repaired and would then send it back to you. Most parts are easy to remove and replace.

### ***What is the expected life of the casing, the moving parts, the air machine as a whole?***

Most casings are made of stainless steel. It is very sturdy and does not ever need to be replaced. It needs to be cleaned every now and then. The fans have a MTBF of approx. 40,000 operating hours. As we have 2 fans inside one air machine, which alternate every 9 hours, this means each fan should "live" for 80,000 hours, being more than 9 years if running constantly. As for the dehumidifier: these have a MTBF of approx. 30-40,000 operating hours, being about 4-4.5 years. The air machine should hold for 25 years if maintained regularly.

### ***Will there be condensation formed from the heating element and if so, is this captured and then drained?***

There is no condensation if the air machine is placed outdoors. The warm humid air exits through the exhaust on the side of the air machine. Should the air machine be placed indoors, the warm humid air should be lead to the outside according to our instructions. There is no condensate tub.

For the elnic eluft ECO versions the condensate must be lead to the outside using a small tube. The condensate is pumped

out of the eluft in the form of water. For installation indoors the necessary drainage needs to be provided.

### ***Working principle of the wind sensor?***

The standard pressure setting is 300 Pa. In case the wind is >10m/s for longer than 6 seconds, the pressure switches to 600 Pa (in one step). The increased pressure is held. If the wind speed falls below 0.5m/s, the pressure will be held for another 6 minutes, only then the pressure will switch back to 300 Pa. As soon as the wind speed is >10m/s again, the pressure switches back to 600 Pa. Should this happen during the 6 minutes of increased pressure, it will not drop to 300 Pa but remain at 600 Pa as long as the wind does not drop below 0.5 m/s.

## FAQ and Answers

### ***Is there a documented/scheduled maintenance schedule for these air handling units that lists parts that need replacing over the life of the system?***

elnic can send a maintenance protocol which shows what needs to be checked. It is very important to change the air filter at least every six months.

### ***How do I calculate which size of eluft machine I need for my project?***

In order to be able to calculate what size of eluft air machine your project needs, please follow these instructions:

**Note:** - This is only valid for the standard eluft machines, not for the eco versions. The latter need less fresh air. In this case please contact us for recommendations.

- Our eluft air machines are frequency-regulated and not based on an ON/OFF system, which needs much more power due to the high initial current. The air supply of our system is continuous. Please keep this in mind.
- The maximum air flow rate of an eluft machine is given for safety reasons and thus much higher than the actual provision of dry air.

1. Take the **total volume** of the ETFE cushions.

If you do not know the volume (m<sup>3</sup>) of the cushions, you can use a rule of thumb:

Divide the total surface (length x width) by two, e.g. if you have 500m<sup>2</sup>, you have approx. 250m<sup>3</sup> (please note this is only an estimate as the total volume also depends on the height of the cushion).

2. In order to avoid humidity inside the cushions, with the help of valves in the cushions, the air is renewed completely twice a day.

For our example, this gives us this formula:  $(2 \times 250\text{m}^3)/24\text{hrs} = \underline{20.83\text{m}^3/\text{h}}$  (= flow rate).

3. Add a natural **leakage** of 5-10%.

Leakage is due mainly from the untight piping system and cushions. In our example that would be  $250\text{m}^3 \times 0.1 = \underline{25.00\text{m}^3/\text{h}}$  air loss.

$$\rightarrow \Sigma \underline{20.83\text{m}^3 + 25.00\text{m}^3/\text{h} = 45.83\text{m}^3/\text{h}}$$

4. Compare your values to our list of eluft machines:

- a. dry air flow rate: 45.83m<sup>3</sup>/h
- b. application for roof/façade volume: 250m<sup>3</sup>

**RESULT: you need an eluft 150  
as this machine can provide up to 80m<sup>3</sup> dry air per hour  
and the total volume lies underneath the maximum of 300m<sup>3</sup>.**

Specifications	eluft Basic	eluft 150	eluft 400	eluft 600	eluft 900	eluft 1400	eluft Mobile
dry air flow rate [m <sup>3</sup> /h]	80	80	190	275	400	800	190
max. air flow as emergency function [m <sup>3</sup> /h]	120	300	800	1200	1800	2800	190
application for roof/facade volume [m <sup>3</sup> ]	<50	< 300	< 800	< 1400	< 2000	< 3700	<300



## Questionnaire Project Request

<b>Company</b>	
<b>Contact person</b>	
<b>Project name</b>	
<b>Project number</b>	
<b>Date of delivery</b>	
<b>Project location</b>	

<b>Total pillow area of roof (m<sup>2</sup>)</b>			
Total pillow volume of roof (m <sup>3</sup> )			
Max. wind load (pascal)			
Max. snow load (pascal)			
Pressure of pillows (pascal)	Standard		Max.
Number of pillows (no.)			
Max. area of single pillows (m <sup>2</sup> )			
Max. volume of single pillows (m <sup>3</sup> )			
Number of layers (no.)			
Movable inner layer for shading	<b>Yes</b>		<b>No</b>
Increase pressure of middle chamber in 4 layer pillows	<b>Yes</b>		<b>No</b>

<b>Total pillow area of façade (m<sup>2</sup>)</b>			
Total pillow volume of façade (m <sup>3</sup> )			
Max. wind load (pascal)			
Pressure of pillows (pascal)	Standard		Max.
Number of pillows (no.)			
Max. area of single pillows (m <sup>2</sup> )			
Max. volume of single pillows (m <sup>3</sup> )			
Number of layers (no.)			

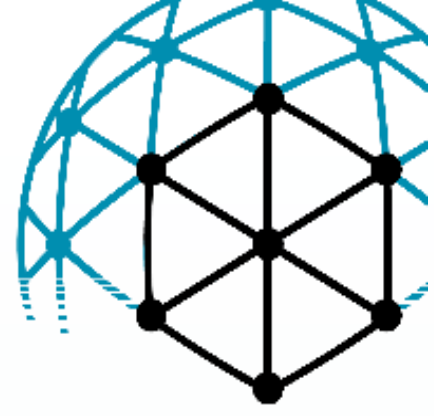
Estimated rate of leakage (%)	
Air exchange/purging air rate within 24 hrs depending on humidity in pillows	

<b>Options</b>	<b>Yes</b>	<b>No</b>
External graphical touch display for status and settings		
WEB SERVER SW		
Master control unit MCU		
Leg extensions		
110/115V 60Hz feature		
Spare filters classes: G4 / F5 / F7 (please enter amount)	G4:	F5: F7:
Snow / rain detection sensor		
Snow height sensor (incremental)		
Snow scales		
Wind speed sensor		
Hygrostat for minimising power consumption (upto eluft 400)		
Automatic dual power source switch		
SMS alert interface		
WAP antenna		

<b>Cable lengths (in m)</b>	
Air machine to nearest pillow	
Air machine to centrally located pillow	
Air machine to furthest pillow	
Air machine to wind sensor (if applicable)	
Air machine to snow sensor (if applicable)	
Tail for power supply to air machine (connected by MC)	

<b>Drawings</b>	
-----------------	--

Options please refer to Specifications Overview of elnic brochure eluft (ECO) systems, pages 15-16, and Optional Devices, pages 6-10



# ELECTRICAL WORKS

# Air Handling Unit High Pressure Humidifying Unit

The adiabatic or the other name evaporative humidification is performed by the high-pressure humidification unit, which is one of the product types used to satisfy the humidification need in the air handling unit. The aim is to raise the relative and absolute humidity of the environment fed by the air handling unit. There are solutions such as steam, honeycomb and high pressure humidification to meet this need

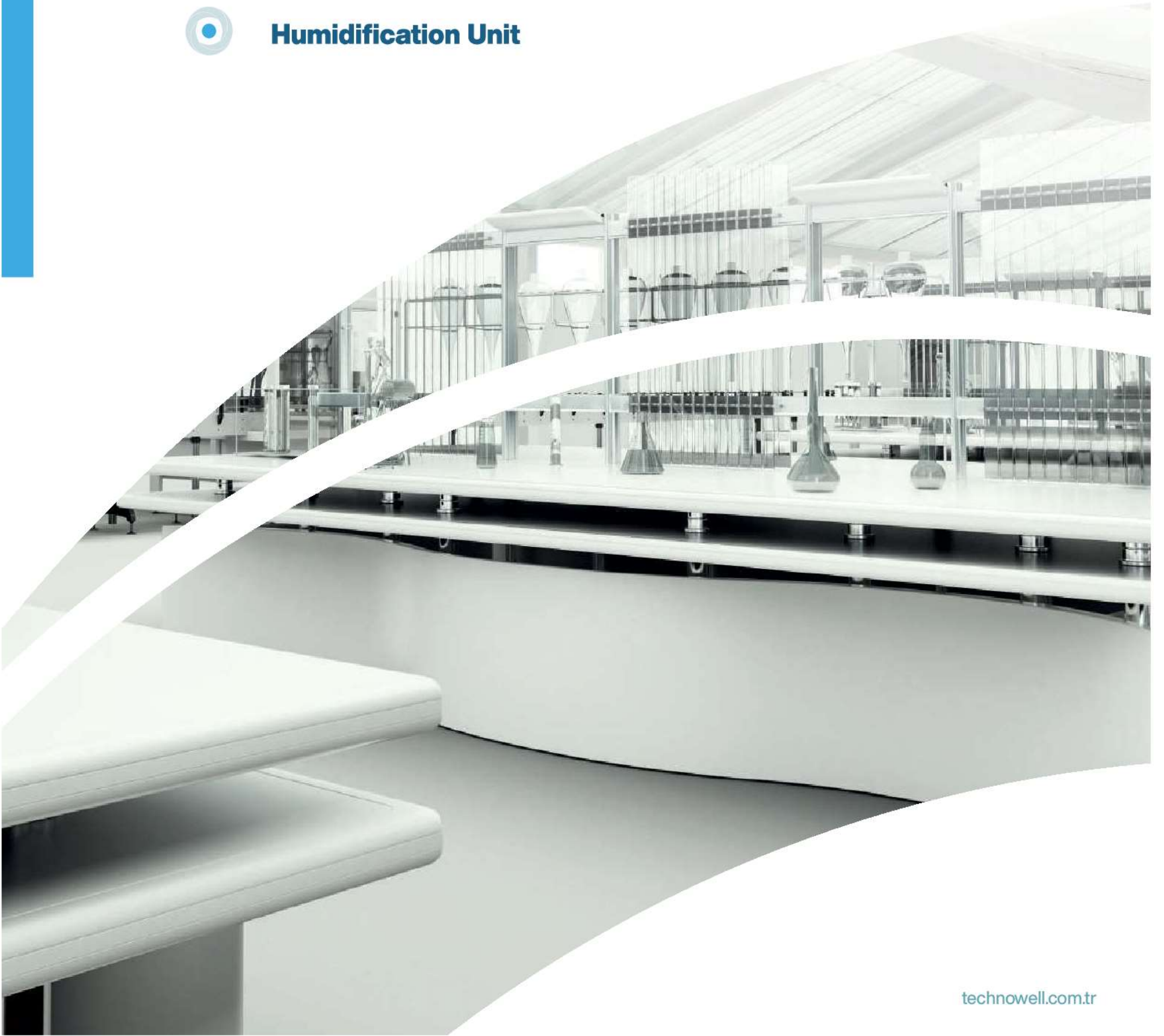




In several ways, a high-pressure humidifier outperforms other methods of humidification. When efficiency, particle size, electricity consumption, and return on investment are considered, it is the preferred method.

Two main units make up the air handling unit's high-pressure humidification unit;

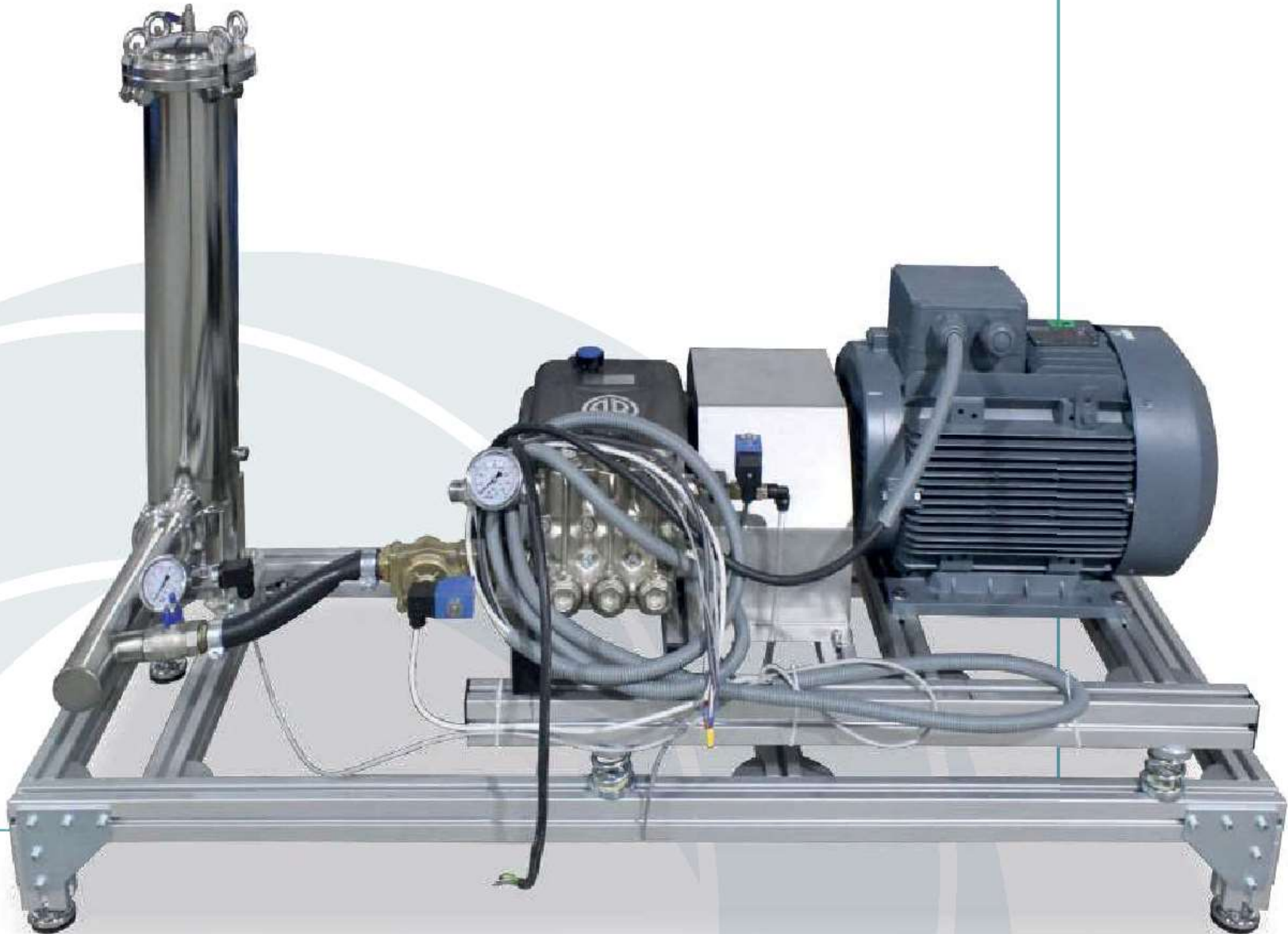
- ① **High-Pressure Pump Station**
- ② **Humidification Unit**



# High-Pressure Pump Station

There is a high-pressure pump at the pump station, selected according to the capacity of the air handling unit. Depending on the capacity, the number of pumps can vary. An electrical panel for the unit, an inverter for capacity control, a solenoid valve, water filters, and an optional touchscreen control panel are all found on this station. This station, which is located between the humidification unit and the network line, is the outdoor unit of the humidification system.

All humidification systems use Danfoss PAH series high-pressure pumps. The pump's most notable features are its long service life (roughly 40,000 hours) and oil-free operation. It works without oil, so there's no need to add oil or substitute felt during maintenance. It's made entirely of stainless steel and the maintenance is very easy.



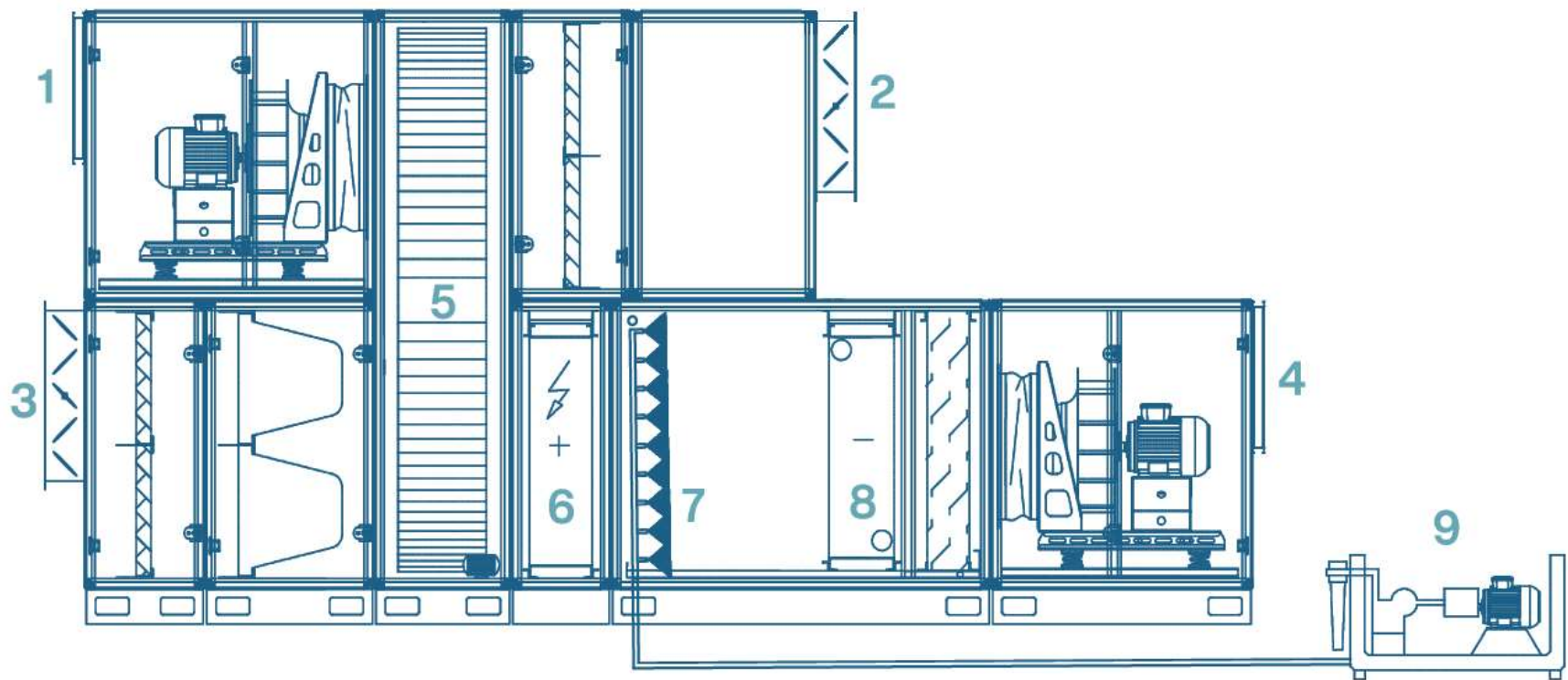


# PUMP MODELS

MODEL	PAH 2.0	PAH 4.0	PAH 6.3	PAH 10	PAH 12.5
BODY MATERIAL	AISI 304	AISI 304	AISI 304	AISI 304	AISI 304
GEOMETRIC DISPLACEMENT	2 cm <sup>3</sup> /rev	4 cm <sup>3</sup> /rev	6,3 cm <sup>3</sup> /rev	10 cm <sup>3</sup> /rev	12,5 cm <sup>3</sup> /rev
MIN. OUTLET PRESSURE	30 bar	30 bar	30 bar	30 bar	30 bar
MAX. OUTLET PRESSURE	140 bar	140 bar	140 bar	160 bar	160 bar
MAINS PRESSURE	0 – 4 bar	0 – 4 bar	0 – 4 bar	0 – 4 bar	0 – 4 bar
MIN. REVOLUTIONS PER MINUTE	700 rpm	700 rpm	700 rpm	700 rpm	700 rpm
MAX. REVOLUTIONS PER MINUTE	1800 rpm	1800 rpm	1800 rpm	1800 rpm	1800 rpm
CAPACITY	2 l/min	5,2 l/min	8,7 l/min	13,4 l/min	17,2 l/min
ELECTRIC ENGINE	0,90 kW	1,70 kW	2,60 kW	4,50 kW	5,60 kW
SOUND LEVEL	76 dB(A)	76 dB(A)	76 dB(A)	75 dB(A)	75 dB(A)
WEIGHT	4,40 kg	4,40 kg	4,40 kg	7,70 kg	7,70 kg
NOTE	The values given for the capacity and electric motor are specified for 1500 rpm. Request information for higher capacity models.				



*Danfoss*



① Inside Air Exhaust

② Inside Air Suction

③ Fresh Air Inlate

④ Inside Air Outlet

⑤ Rotary Type Heat Recovery Unit

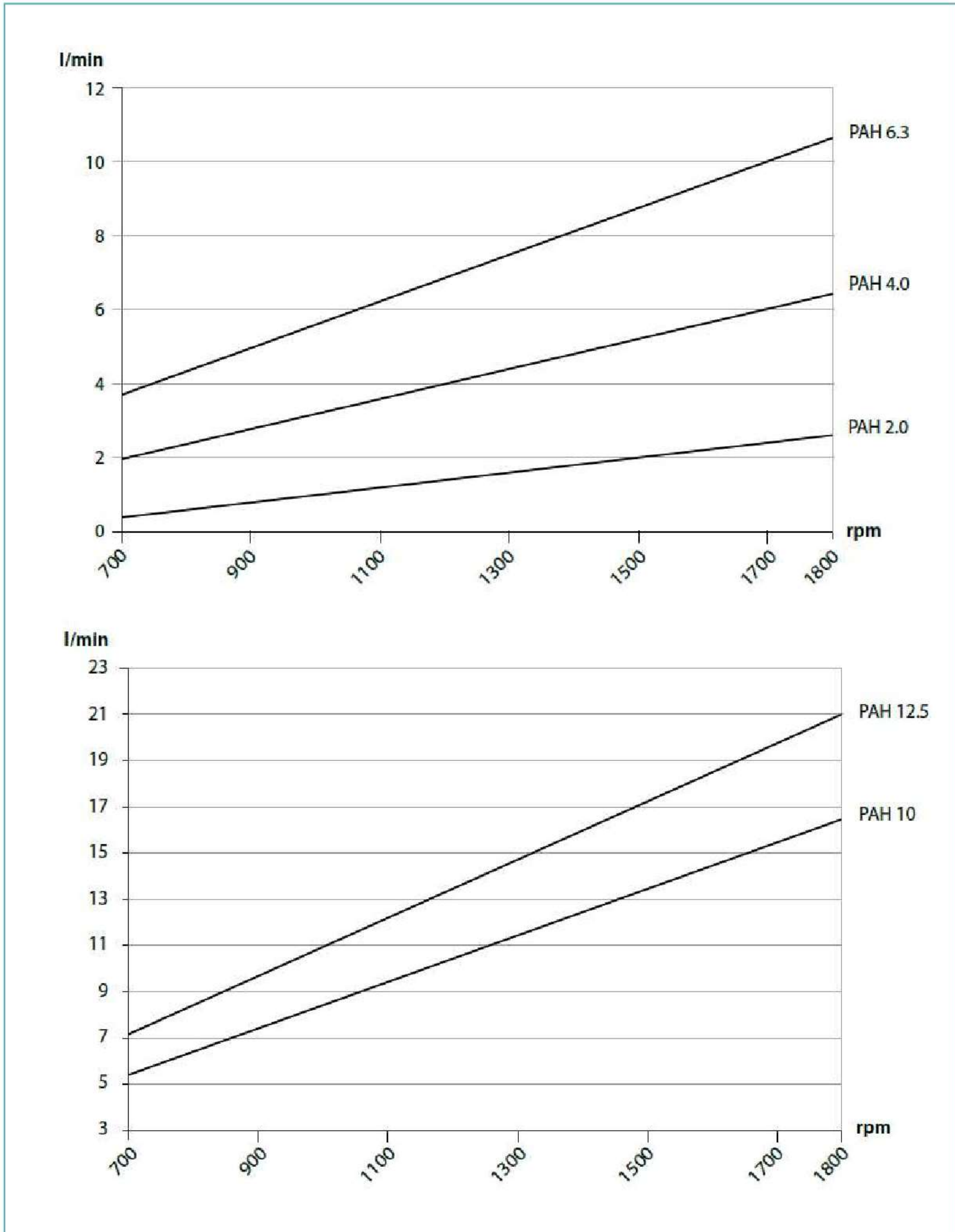
⑥ Heating Coil

⑦ High-Pressure Nozzle System

⑧ Cooling Coil (Drop eliminator according to air velocity at empty cross-section)

⑨ High-Pressure Pump Unit

# PERFORMANCE CURVES OF PUMPS

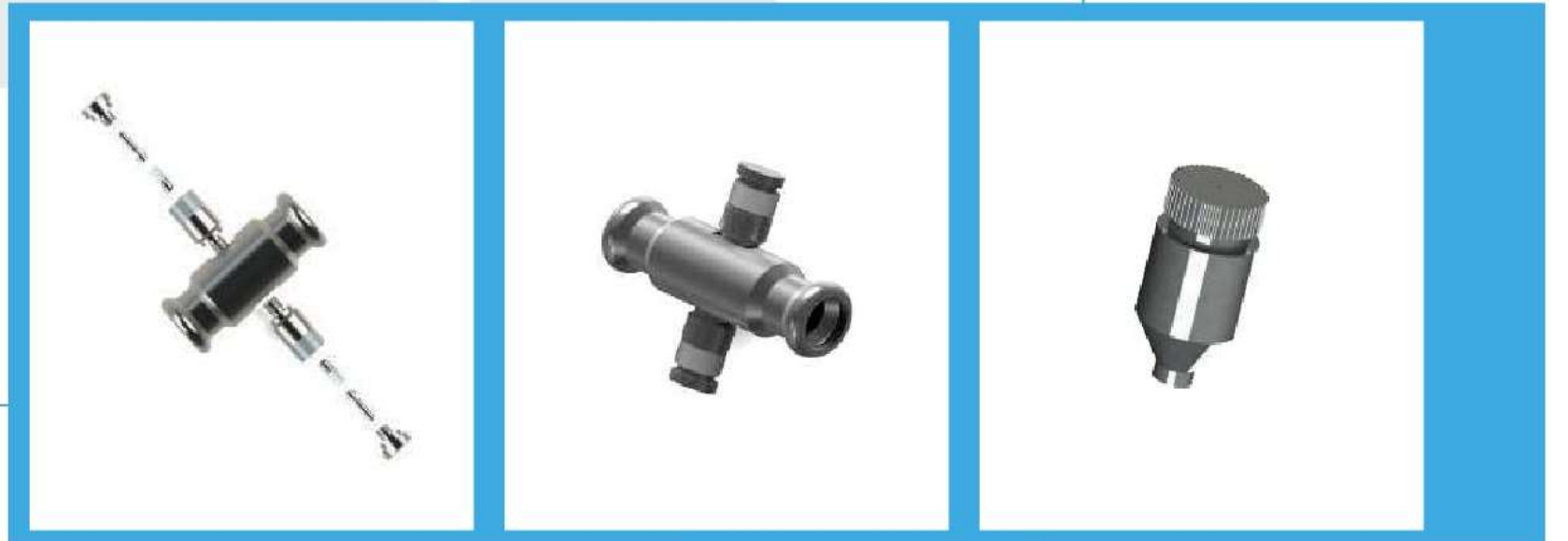


# Humidification Unit

There are stainless steel nozzles and pipes on the humidification unit, which are determined according to the capacity. To ensure homogeneous humidification, the distances between the nozzle and the pipe are computed specifically based on the cross-sectional areas provided by the plant manufacturer. Total capacity varies depending on the air handling unit's air-flow rate and the desired humidity conditions. To determine the pump model and calculate capacity, the following information is needed:

- **Air Handling Unit Air Volume (m<sup>3</sup>/h)**
- **Inlet Air Dry Bulb Temperature (° C)**
- **Inlet Air Relative Humidity (% RH)**
- **Desired Outlet Air Dry Bulb Temperature (°C)**
- **Desired Outlet Air Relative Humidity (%RH)**

The nozzle, frame and pipes used are all stainless steel. Although there are nozzle options with appropriate diameters for various capacities, their numbers are determined for a uniform distribution based on the air handling unit's flow rate and cross-sectional area. To increase the nozzle capacity of a cell with a very high flow rate and a small cross-section, a nozzle with a large hole diameter is used.

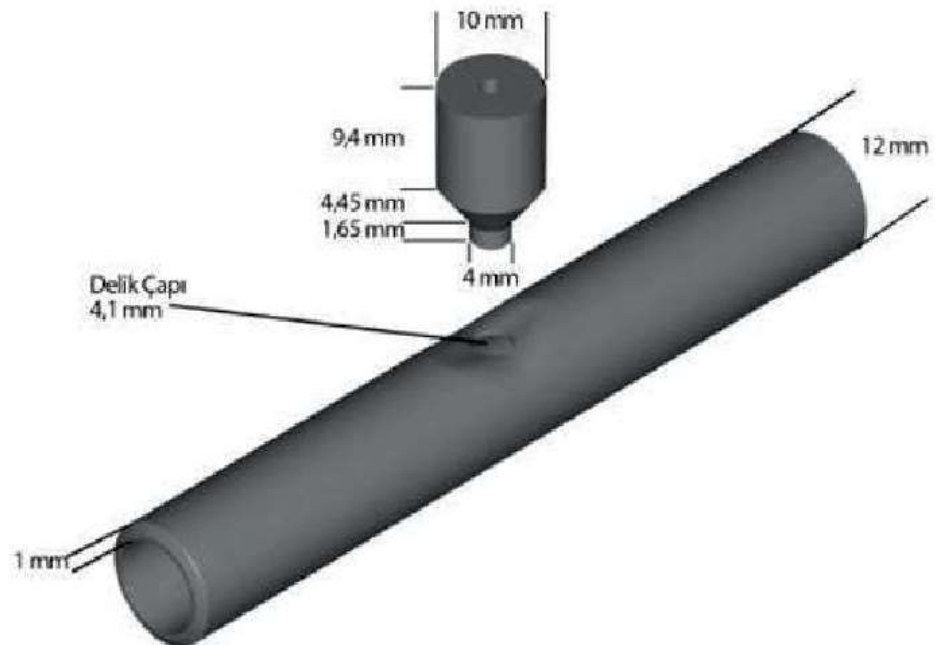




# Capacity Selection and Automation

To make it easier to choose, air handling unit manufacturers use precise cross-sectional dimensions for specific air-flow speeds. The table below shows the units and capacities chosen as averages based on these air-flow rates and air handling unit cross-sectional dimensions.

<b>NOZZLE CAPACITIES</b>				
NOZZLE DIAMETER	0,15 mm	0,20 mm	0,30 mm	0,50 mm
70 BAR CAPACITY	2,90 l/h	4,30 l/h	6,90 l/h	13,00 l/h
80 BAR CAPACITY	3,10 l/h	4,70 l/h	7,40 l/h	14,00 l/h
100 BAR CAPACITY	3,50 l/h	5,30 l/h	8,30 l/h	15,60 l/h



# EXAMPLE CAPACITY SELECTION

MODEL	POWER PLANT CELL INTERNAL SECTION	AIR VOLUME	PUMP MODEL	HUMIDIFICATION CAPACITY
ACHP-2	1220 x 1530 mm	15000 m <sup>3</sup> /h	PAH 2.0	72 kg/h
ACHP-2	1220 x 2140 mm	22000 m <sup>3</sup> /h	PAH 2.0	106 kg/h
ACHP-4	1530 x 2140 mm	28000 m <sup>3</sup> /h	PAH 4.0	135 kg/h
ACHP-4	1530 x 3060 mm	40000 m <sup>3</sup> /h	PAH 4.0	192 kg/h
ACHP-4	1830 x 3060 mm	50000 m <sup>3</sup> /h	PAH 4.0	240 kg/h
ACHP-4	2140 x 3360 mm	60000 m <sup>3</sup> /h	PAH 4.0	288 kg/h
ACHP-6.3	2140 x 4280 mm	70000 m <sup>3</sup> /h	PAH 6.3	336 kg/h
ACHP-6.3	2440 x 3670 mm	80000 m <sup>3</sup> /h	PAH 6.3	384 kg/h
ACHP-6.3	2440 x 3670 mm	80000 m <sup>3</sup> /h	PAH 6.3	384 kg/h
ACHP-6.3	2440 x 4590 mm	100000 m <sup>3</sup> /h	PAH 6.3	480 kg/h
CAPACITY SELECTION CONDITION	Entry Requirement	35 °C - %20 RH		
	Exit Condition	25 °C - %60 RH		
NOTE	The capacities have been chosen based on the flow rate and cross-section dimensions of the air handling unit. The values in the table are not exact and reflect the average values of the above-mentioned climatic conditions.			

Different scenarios can be used if automation is requested. The humidification unit can be monitored and controlled remotely. The pump can be driven with an inverter or used as On-Off. In the humidification unit, precise control can be achieved. Using solenoid valves, the humidification unit is divided into compartments for gradual control application, and each compartment can be controlled independently.

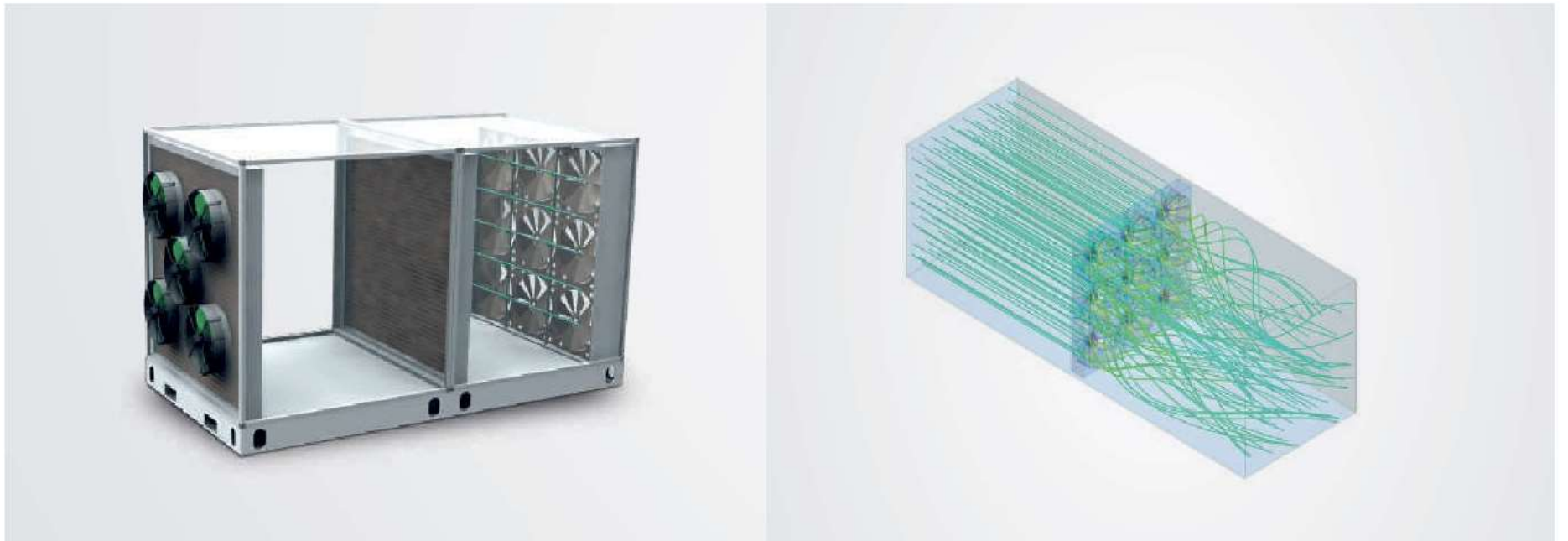
## Automation Scenarios

**On-Off:** At a constant pressure of 80 bar, all nozzles in the humidification unit open at the same time and deliver moisture to the air handling unit cell. When the necessary humidity is present in the indoor climate, the system shuts down automatically.

**Gradual Control:** The humidification unit's nozzles are divided into four main zones, with the 1st mainline providing a continuous capacity of at least 25%. The required moisture requirement is met with gradual control by opening the 2.-3.-4. mainline, in case of need.

## Air Turbulator

In order for the air to be sufficiently saturated with moisture when a high-pressure humidification unit is used in a standard air handling unit, a minimum cell with a length of approximately 1.80 - 2.00 m is needed. As a result, increasing the cell size raises the costs. Productivity starts to decline as the cell size shrinks. Intense water drainage is observed before the drop eliminator as a result of water drift. Even if the power plant manufacturer produces a suitable length power plant for this unit, there would not be enough room to position it in the field. In this case, air diverters are used, which are entirely manufactured and designed by the Technowell Engineering group.



## Water Quality

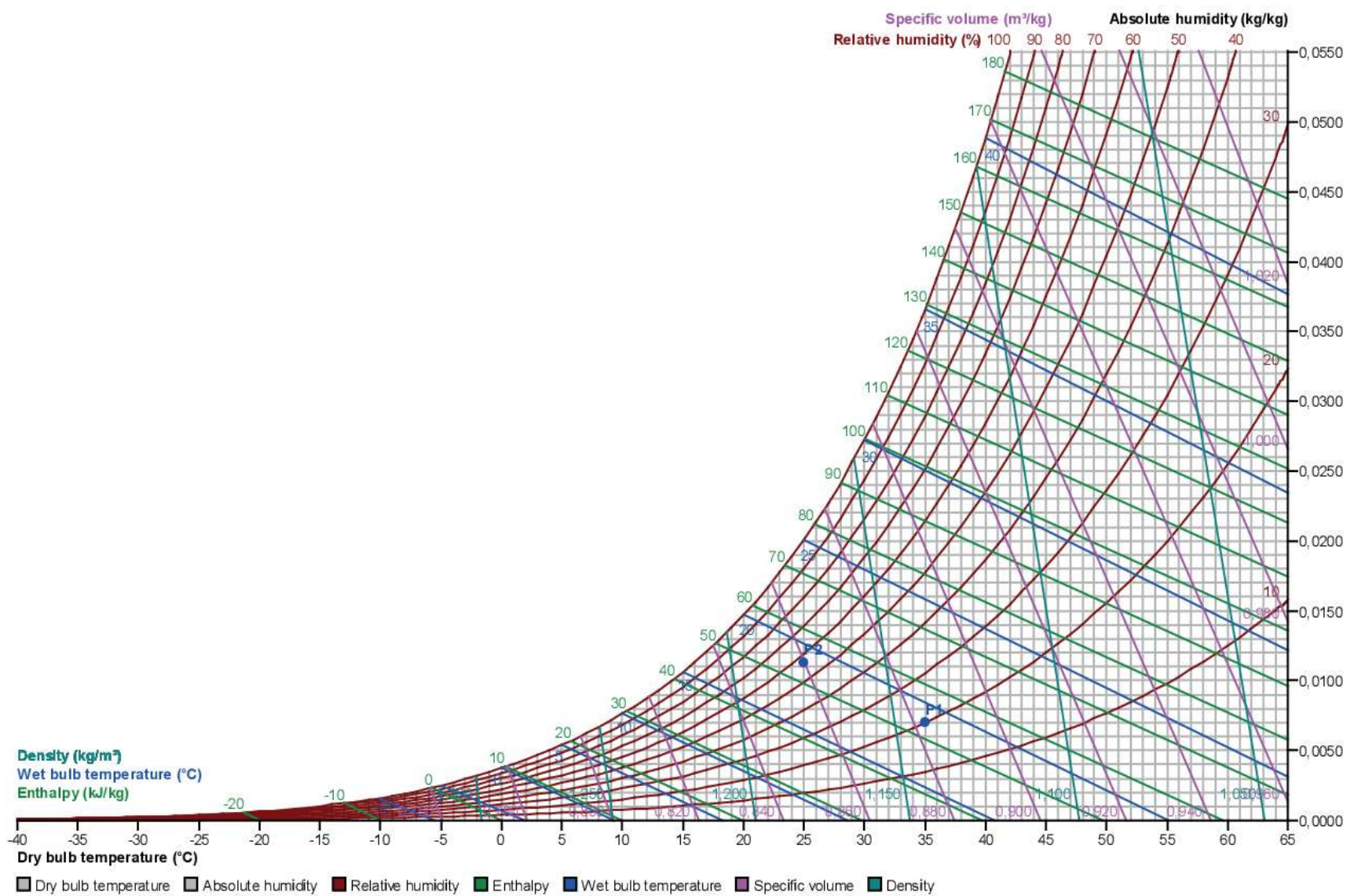
There are two filters on the pump station to filter the water taken from the mains line and sent to the pump. Filters should be closely followed and replaced according to a predetermined procedure to ensure pump health and productive humidification. To control internal leakage and improve component performance, Danfoss PAH series pumps have a very narrow dead space design.

A 10  $\mu\text{m}$  absolute filter with a beta value of  $\beta_{10} \geq 5.000$  and an efficiency rate of 99.98% is used as the main filter. This filter is efficient enough that it only allows 20 particles out of 100,000 to pass through.



## High-Pressure Humidification and Psychrometric Diagram

In high-pressure humidification processes, there is no audible heating or cooling. Since the moisture released into the environment has a small enough particle size to blend with the air, evaporation is facilitated, and the environment naturally cools. The enthalpy remains constant in the process since there is no sensible heating or cooling. After the humidification process, the temperature decreases. As moisture is provided to the atmosphere, absolute humidity rises. Depending on the absolute humidity, the relative humidity also increases.



## Electricity Saving and Efficiency

Because of its high efficiency and low energy usage, a high-pressure humidification unit is favored over a steam humidifier. The pump station's electric motors use very little energy because instead of heating the water, it pulverizes it with a 0.2 mm nozzle at high pressure. But the temperature drops after the high-pressure humidification process. Extra preheating can be needed if temperature and humidity are significant in the system. As compared to a steam humidifier, the high-pressure humidifier has a self-compensation duration of about 4 months.

**SYSTEM OPERATING CONDITIONS AND GENERAL INFORMATION**

MAINS WATER PRICE	1,5768 \$/m <sup>3</sup>
ELECTRICITY PRICE	0,0939 \$/kWh
SYSTEM DAILY WORKING HOURS	18

**TECHNICAL DATA BEFORE HIGH-PRESSURE HUMIDIFICATION UNIT**

SYSTEM ELECTRICITY CONSUMPTION	67,60 kWh
SYSTEM MONTHLY ELECTRICITY CONSUMPTION	36.504 kWh
SYSTEM MONTHLY ELECTRICITY BILL	\$3.427,72
TOTAL INVOICE PAID MONTHLY	\$3.427,72

**TECHNICAL DATA BEFORE HIGH-PRESSURE HUMIDIFICATION UNIT**

HUMIDIFICATION UNIT ELECTRICITY CONSUMPTION	2,20 kWh
HUMIDIFICATION UNIT MONTHLY ELECTRICITY CONSUMPTION	1.188 kWh
HUMIDIFICATION UNIT MONTHLY ELECTRICITY BILL	\$111,55
HUMIDIFICATION UNIT WATER CONSUMPTION	660 lt/h
HUMIDIFICATION UNIT MONTHLY WATER CONSUMPTION	356,4 m <sup>3</sup>
HUMIDIFICATION UNIT MONTHLY WATER BILL	\$561,97
TOTAL INVOICE PAID MONTHLY	\$673,52

**GAIN AMOUNTS AFTER HIGH-PRESSURE HUMIDIFICATION UNIT**

MONTHLY EARNINGS AFTER HUMIDIFICATION UNIT	\$2.754,2
HUMIDIFICATION UNIT SELF COST RECOVERY TIME	≤4 Months



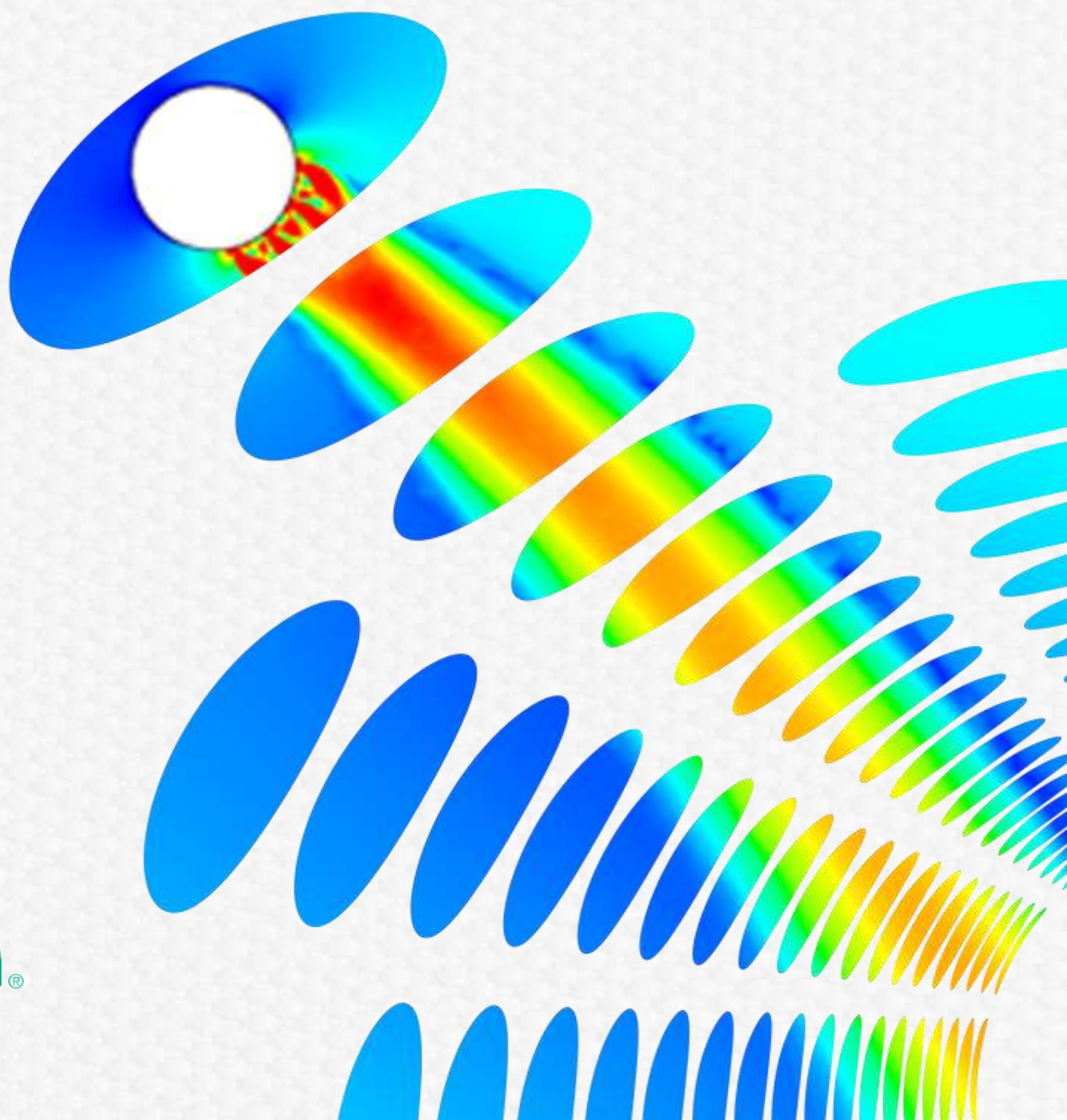
Tailor-made Air  
Ducting&Diffusers

# FABRIC DUCTING&DIFFUSERS

## Technical data

---

English version





# Contents

<b>1. OPERATION OF FABRIC DUCTING &amp; DIFFUSERS</b>	<b>3</b>
1.1. Air Outlet from a Diffuser	3
1.2. Air Entry into Negative Pressure (extract) Ducting	6
1.3. Air Transfer Ducting	6
<b>2. PRIMARY CHARACTERISTICS OF PRIHODA PRODUCTS</b>	<b>7</b>
2.1. Cross Section	7
2.2. Dimension	8
2.3. Length	8
2.4. Pressure	9
2.5. Possible End Alterations	9
<b>3. INSTALLATION</b>	<b>10</b>
<b>4. DESIGN FEATURES</b>	<b>12</b>
<b>4.1. Products for special use</b>	<b>12</b>
Membrane Diffuser	
Negative Pressure Ducting	
Insulated Ducting	
Fabric Noise Attenuator - QuieTex	
Double Ducting	
Lantern with Membrane	
Antistatic Design	
Fabric Shutter	
Defrost Damper	
Combined Halfround Section	
Fabric Tiles SquAireTex	
<b>4.2. Solutions for large ranges of air currents</b>	<b>16</b>
Small Nozzles	
Big Nozzles	
<b>4.3. Products with configurable parameters</b>	<b>17</b>
Closable Nozzles	
Adjustable Perforation	
Adjustable Length and Arch	
<b>4.4. Solutions of problems with air flows</b>	<b>18</b>
Equalisers	
Pockets	
Damper	
Diffuser for Intensive Cooling	
Antideflector	
Beat Absorber	
<b>4.5. Appearance improvement</b>	<b>20</b>
Tensioner in the profile	
End Support	
End Tensioning	
Arcs	
Tyres	
Helix reinforcing system	
Prihoda Art	
LucentAir	
Office design	
<b>4.6. Mounting simplification</b>	<b>23</b>
Winch	
<b>5. MATERIAL</b>	<b>24</b>
5.1. Important Benefits	24
5.2. How to Choose a Suitable Fabric	25
<b>6. MAINTENANCE</b>	<b>26</b>
<b>7. FREQUENTLY ASKED QUESTIONS</b>	<b>27</b>
<b>8. EXAMPLES OF APPLICATIONS</b>	<b>29</b>

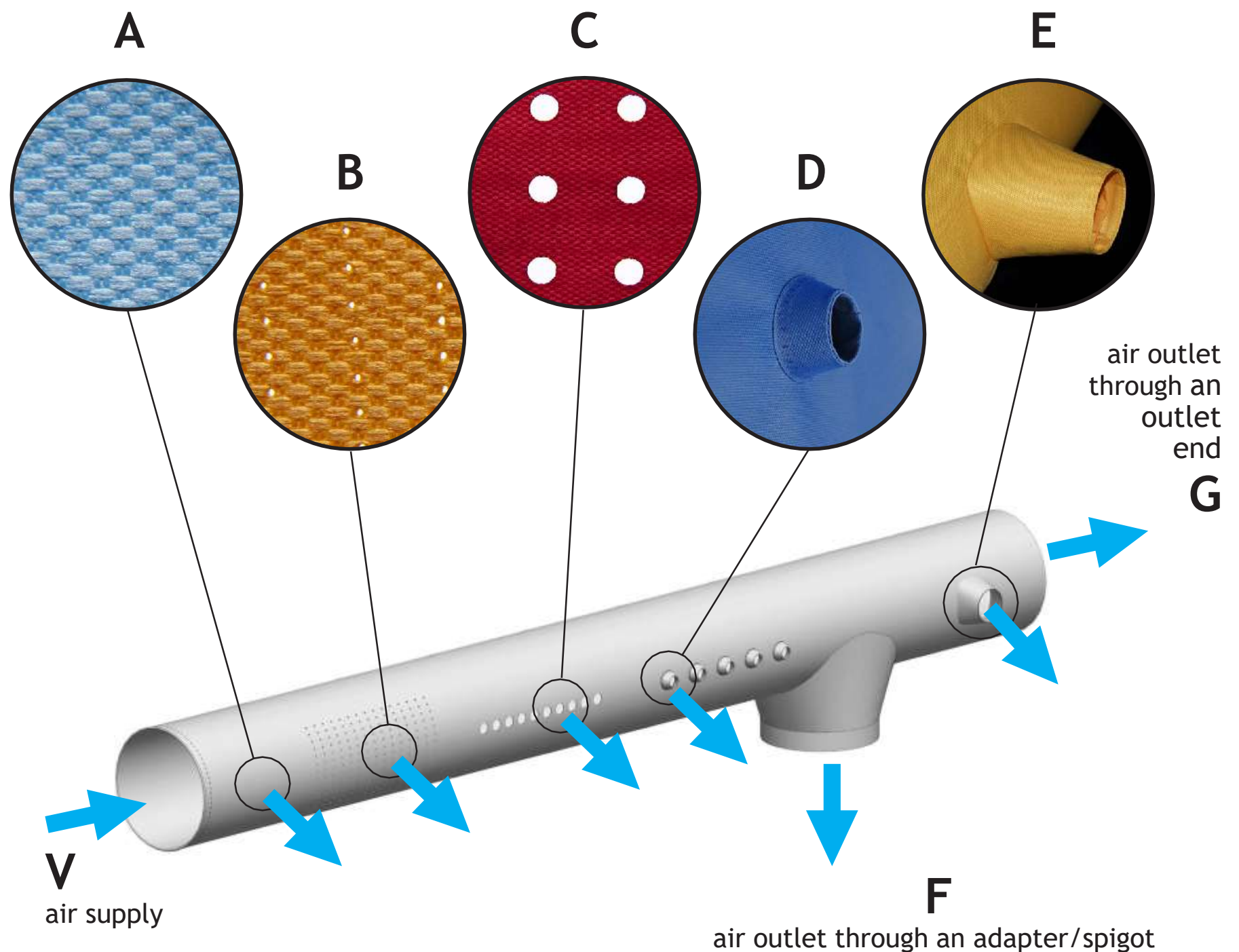
# 1. Operation of Fabric Ducting & Diffuser

Prihoda products are usually acting as both supply air ducting (air transfer) as well as air distribution/diffusion into the occupied zone. We supply both types of system, (1) positive pressure distribution systems (supply air) and (2) negative pressure (extract /return air) ducting for exhausting air from rooms.

## 1.1. Air Outlet from a

Supply air (see V below) flowing into the diffuser through either end or an inlet spigot, can exit the diffuser in any of the following methods:

- A - through the permeable fabric material
- B - through microperforations - 200 - 400 µm laser cut holes in the fabric
- C - through perforations - laser cut holes with a diameter greater than 4 mm
- D - through small fabric nozzles
- E - through big fabric nozzles
- F - through an adapter/outlet spigot - air is diverted to another system/area
- G - through an outlet end - air leads to another system/area



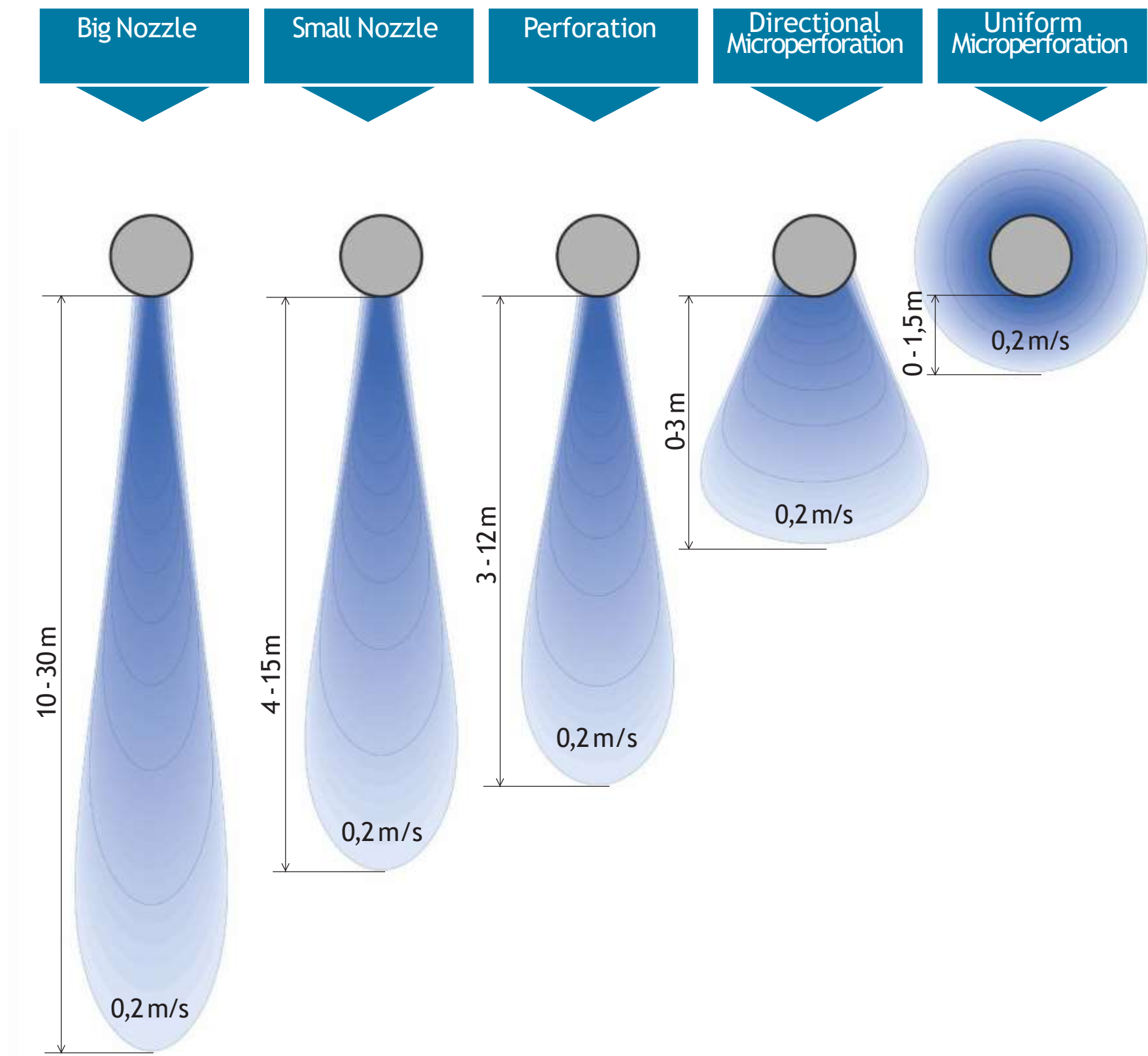
**It always holds true that:  $V = A + B + C + D + E + F + G$**

(certain values of A, B, C, D, E, F, G may be zero)

Supply air is delivered through fabric diffusers using almost any diameter of laser cut perforation in any position on the duct circumference. This combination of any size and position of perforations provides an almost infinite number of design variations. The range of possibilities begins with low velocity diffusion and continues up to long-distance targeted air supply. Small perforations with a diameter of 200 - 400  $\mu\text{m}$ , which we refer to as microperforations, are designed mainly for use as low velocity air diffusion. We use a series of 4 mm diameter or larger holes, which we call perforations, to provide directed air supply. When calculating the air travel distance, the supply air to room temperature difference must be considered.

Fabric Diffusers are a universal air distribution tool and cover the entire range of air delivery patterns. We achieve the requested air distribution by selecting the correct air outlet method. We can combine the air outlet methods on a single diffuser duct in any pattern or ratio we wish.

## Airflow Travel Distance from Fabric Diffusers

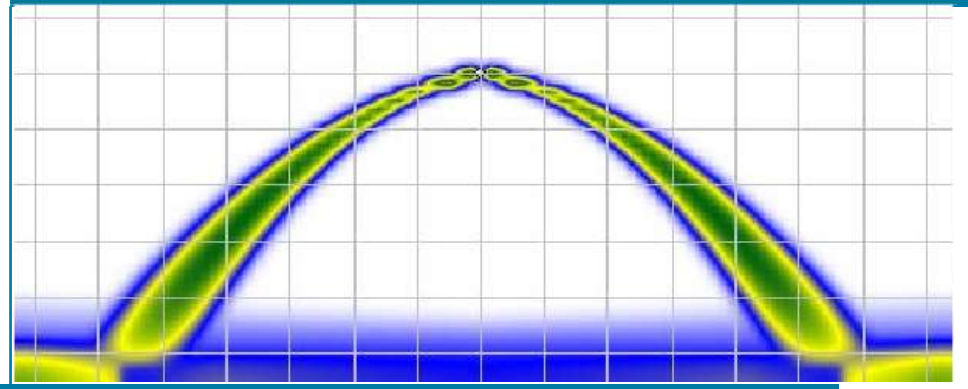


Travel distance varies depending upon available static pressure and temperature difference.

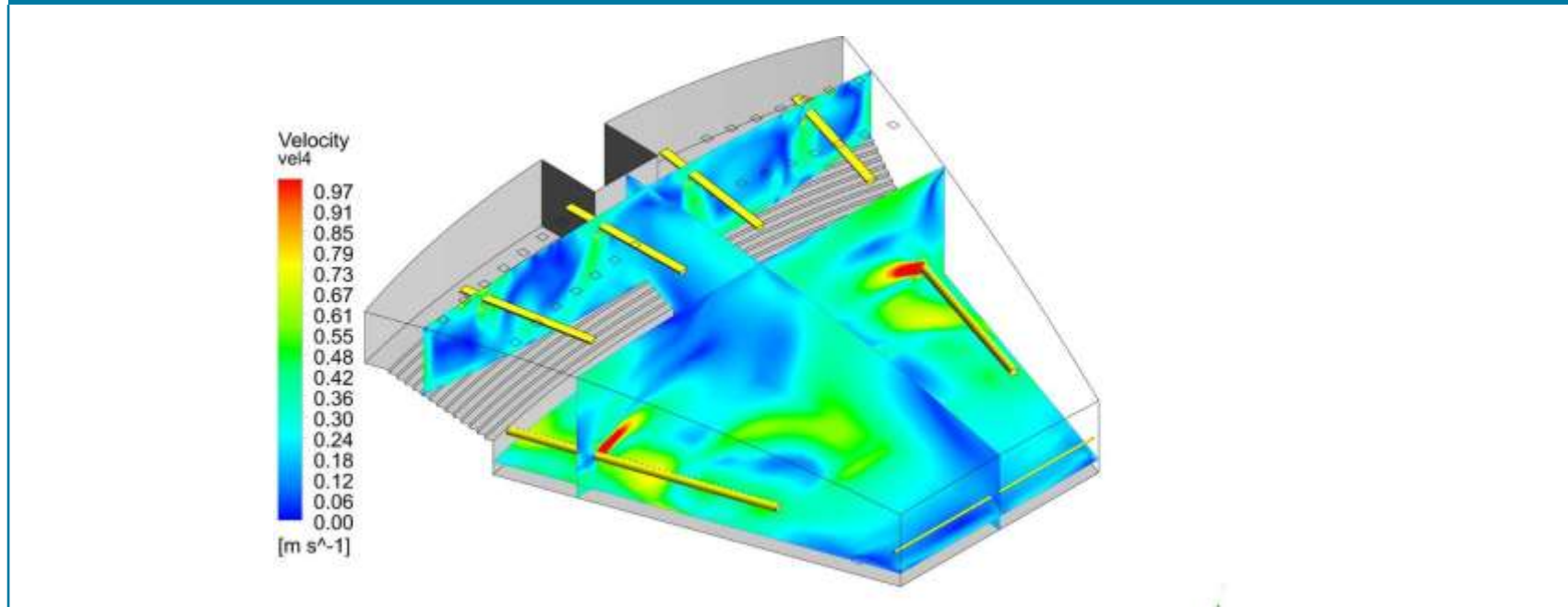


The air velocity at various distances from the diffuser can be calculated by our 'in house' design software which is being constantly refined and takes into account all associated design influences. These include specifically, positive pressure in the diffuser, position and dimensions of outlet openings, and temperature difference. In cases where the air velocity cannot be reliably calculated by the software (due to complex interaction of multiple airflows for example) we can provide these calculations by means of our Fluent software.

Airflow patterns created by PRIHODA design software

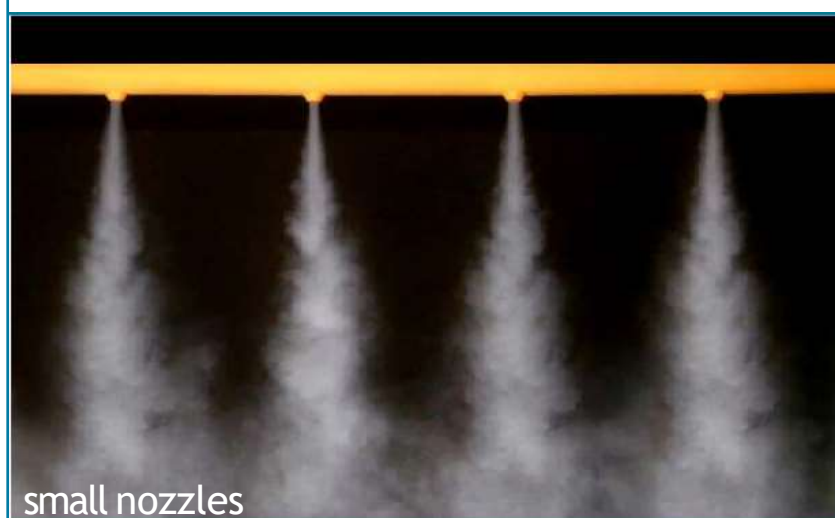


Airflow pattern created by Prihoda using Fluent Software



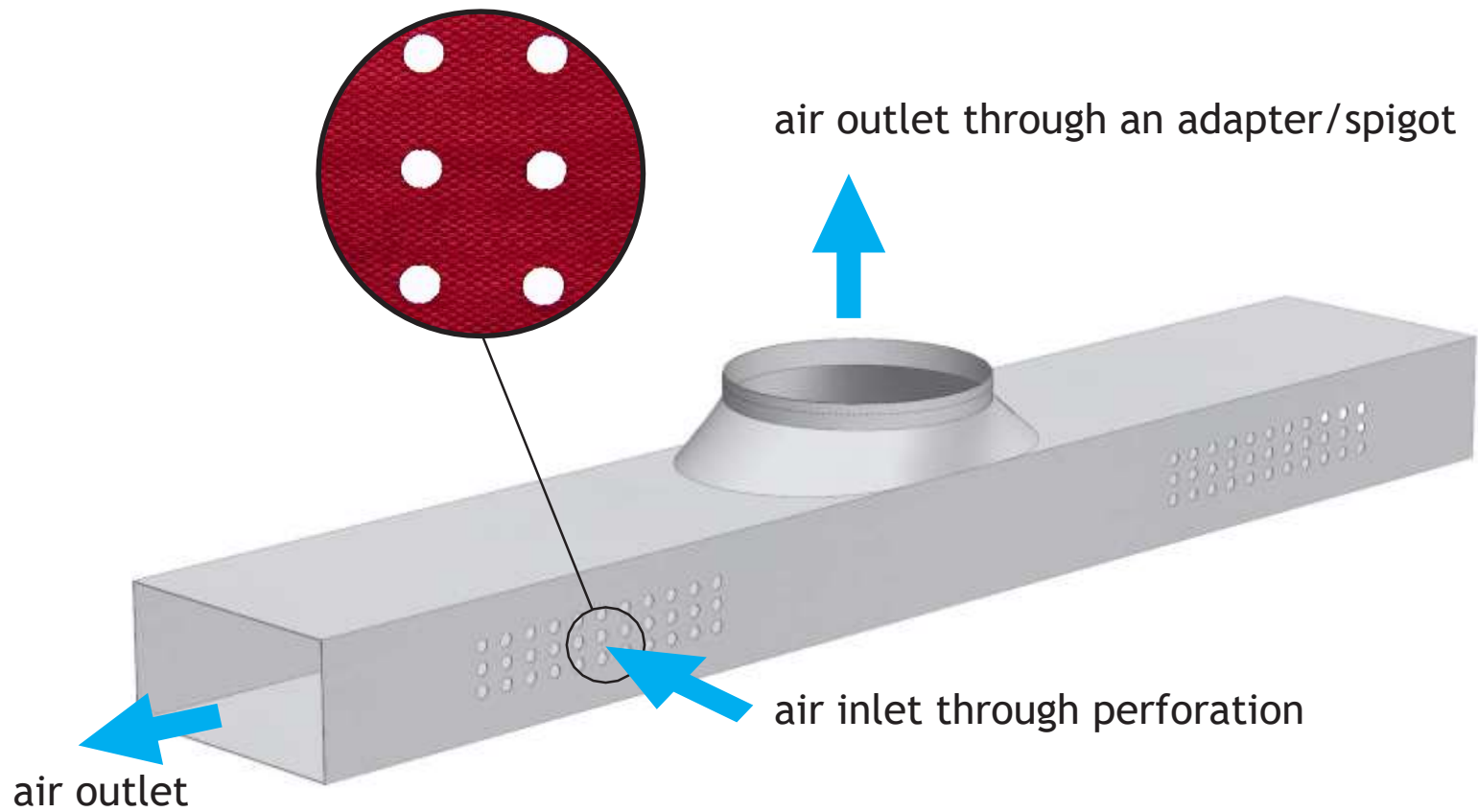
In general, Prihoda Fabric Diffusers operate at similar air flow velocities to traditional ducting. The maximum speed within the duct is dictated by aerodynamic noise in relation to the place of use. A further velocity limitation may be needed due to flow turbulence, which can cause vibration of the fabric. Specific conditions of flow, static pressure and weight of the fabric used must be taken into account.

Examples of airflow patterns created using smoke tests in the PRIHODA R&D centre



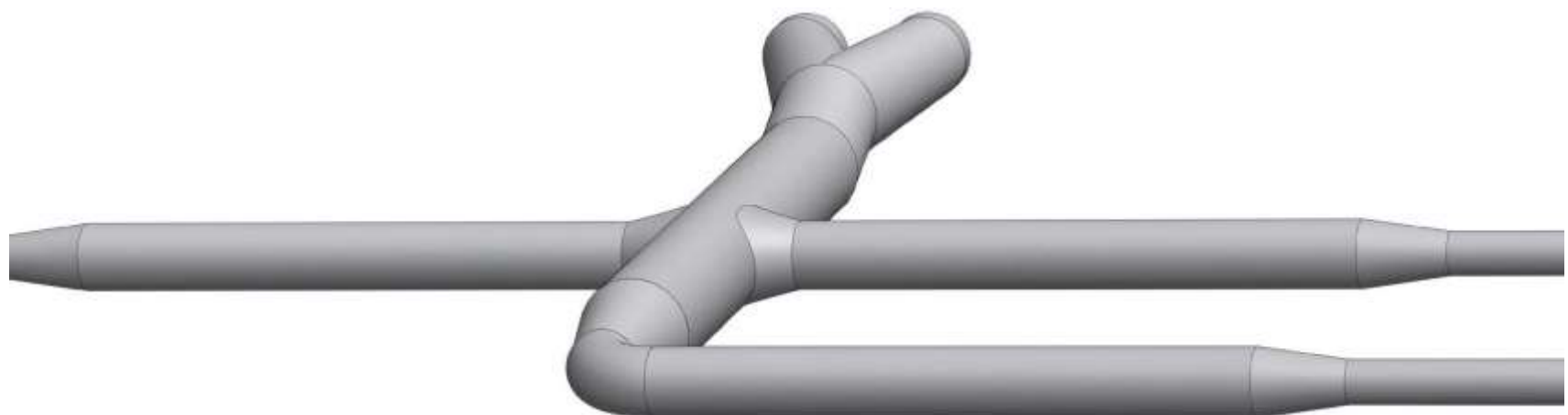
## 1.2. Air Entry into Negative Pressure

Perforations are used to allow extract air into negative pressure ducting.



## 1.3. Air Transfer

Ducting made from impermeable fabric or insulated ducting transports air to the destination WITHOUT diffusion. We have the technical ability to design and manufacture, branches, bends and other fittings for any situation.

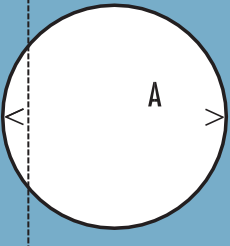
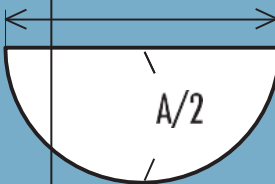
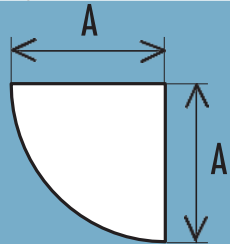
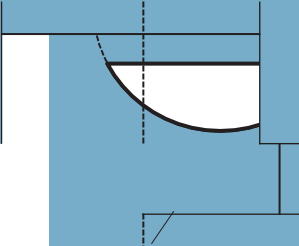
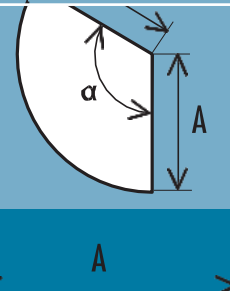

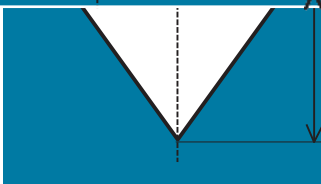


2.

# Primary Characteristics of Prihoda Products

2.1.

## Cross Section

POSITIVE PRESSURE ONLY	C	CIRCULAR		The standard shape, easy maintenance, preferentially recommended.
	H	HALF-ROUND		For use where there is not enough space for circular diffuser and aesthetic applications.
	Q	QUARTER-ROUND		For use where there is not enough space for circular diffuser, in aesthetic applications and if the diffuser is to be installed in the corner of a room.
	SG	SEGMENT		For use where there is not enough height for a half-round diffuser.
	SC	SECTOR		Available if the room corner construction requires a different shape to quarter round.
OVER PRESSURE AND NEGATIVE PRESSURE	S	SQUARE		This shape requires a special suspension structure (provided) to clamp and support all corners.
	T	TRIANGULAR		The triangular shape is maintained by placing a heavy weight at the bottom of the duct to maintain tension on the walls of the material.

We also make fabric transitions to adapt and join different shapes together.

In the case of Square and Triangular ducts the shape partially deforms upon duct inflation, due to positive pressure or negative pressure and the flexibility of the material.



## 2.2. Dimensi

We manufacture fabric ducting and diffusers of all dimensions from 100 mm to 2000 mm, each designed to specific requirements. The duct inlets and connection spigots are always manufactured 10-15 mm larger than the specified size / diameter for ease of connection.

Standard manufacturing dimensions (other sizes are available):

100, 125, 160, 200, 250, 315, 400, 500, 630, 710, 800, 900, 1 000, 1 120, 1 250, 1 400, 1 600, 1 800, 2 000

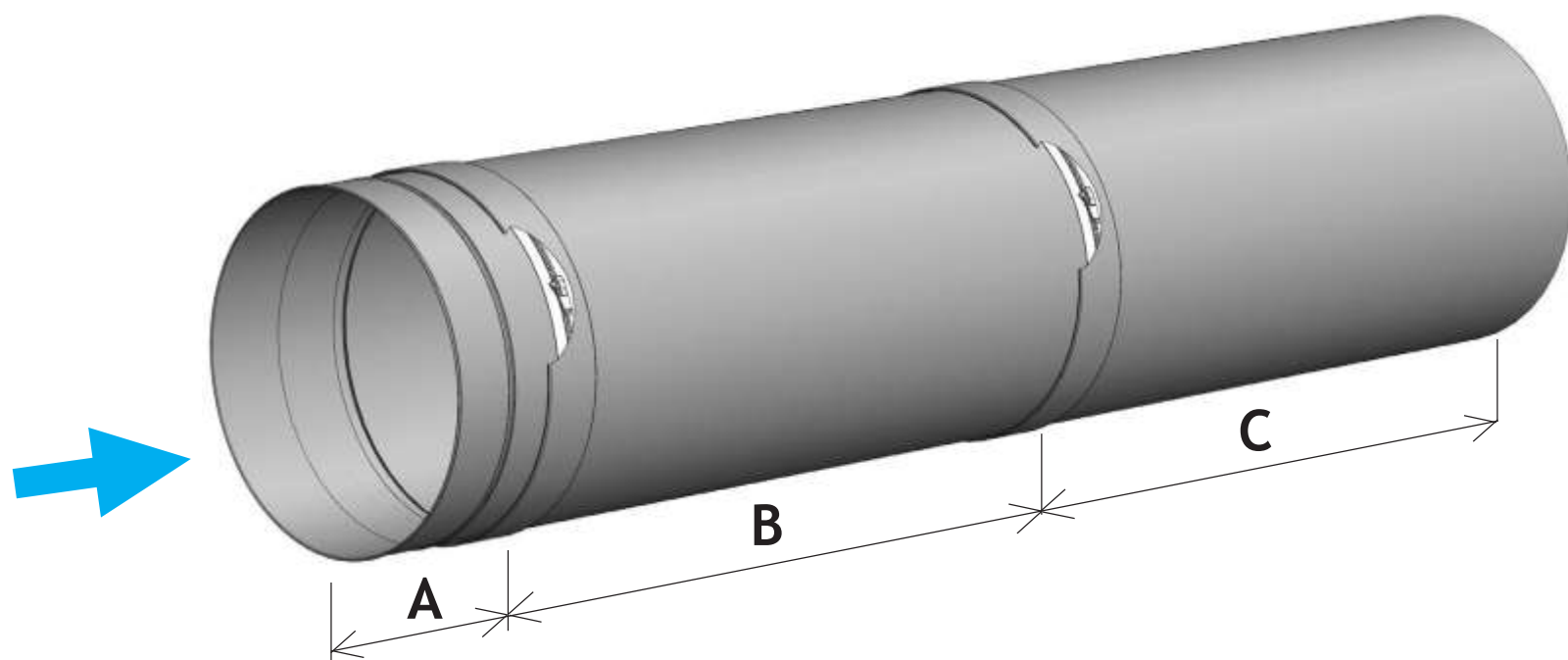
Shape	Dimension (values A,B)
circular	diameter (A)
half-round	diameter (A)
quarter-round	radius (A)
segment	width, height (A,B)
sector	radius (A)
square	length of edges (A,B)
triangular	base, height (A,B)

## 2.3. Length

Determining the length of Fabric Ducting & Diffusers depends primarily on the availability of space.

We can manufacture a fabric diffuser to deliver the same air volume whether the duct is short or long, the precise design depends on the material type, perforation designs and system pressure.

### CUSTOMARY PARTS & LENGTHS



**A - Beginning (edge /zip) - length 100 mm - 200 mm**

**B - Continuous part (zip/zip) - length 5000 mm -10000 mm, these are multiplied to create the correct duct length**

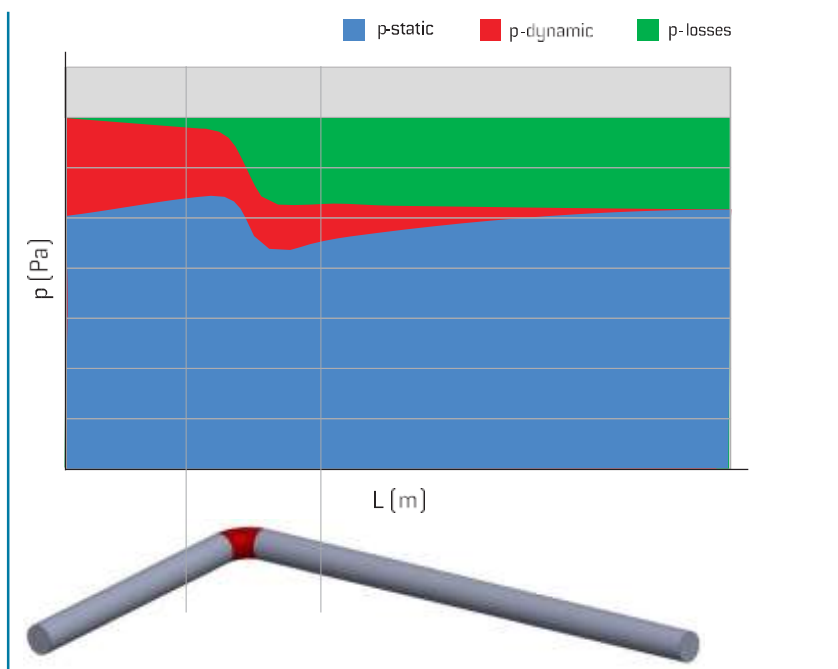
**C - Blind part (zip/end) - length from 100 mm to 11000 mm**

- Individual parts are connecting with zippers; the number of zippers (or the distance between them) is flexible and can be specified by the customer.
- Only the overall length in mm (A + B + C) is provided in the specification, the ducting and diffusers are separated into segments during production.

## 2.4. Pressu

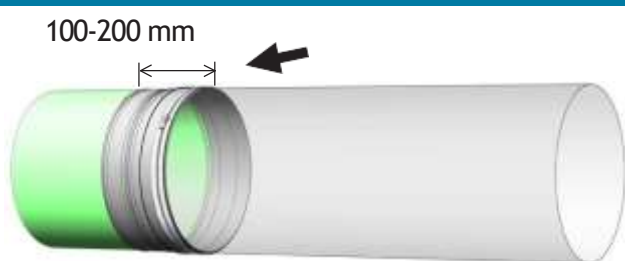
Pressure losses of Fabric Ducting & Diffusers are very similar to those in the traditional ducting. Calculating a more complex fabric distribution system is achieved using similar methods to those for sheet metal ducting. The minimum static pressure necessary to keep the correct shape of a Fabric Duct or Diffuser depends upon the weight of the fabric used. A minimum of 20 Pa is sufficient for light materials and 50 Pa necessary for medium and heavy ones. The pressure distribution along Fabric Diffusers is different from traditional sheet metal ducting because with declining airflow longitudinal velocity decreases. To verify the design of your fabric distribution system, please contact us.

Pressure distribution in a Fabric Diffuser



## 2.5. Possible End

F BEGINNING (WITH ZIP)



H HEM (WITHOUT ZIP)



WOUT OUTER WING



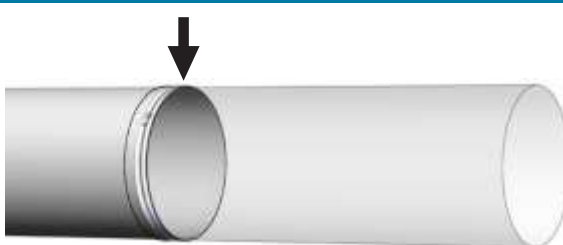
WINNER WING



B BLANK END



Z ZIP


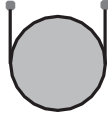
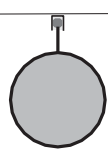
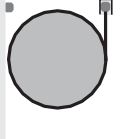
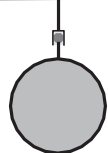
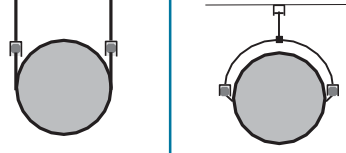
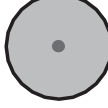
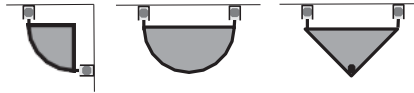
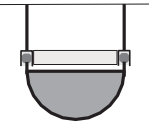
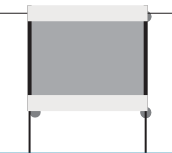
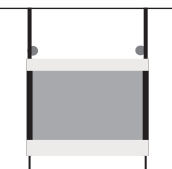


S STITCHED



3.

# Installation

Installation no.	Cross section view	Type of suspension	Additional accessories designation (see overview chart below)
0	without mounting material and hooks or enlarged strips		
1		wire	D, F, K, M
2		wire	D, F, K, M
3		profile, velcro	A, B, C, G, J, L, H
4		profile	B, C, G
5		suspended profile	A, B, C, G, I, D, E, F, K, L, M
6		suspended profile	A, C, G, I, D, E, F, K, L, M N
7		tensioner	D, F, H can be added to all other installation types
8		profiles, velcro	A (always used for triangular shaped ducts), B, C, G, L, H, J
9		profiles	A, D, E, F, K, L, M
10		profiles	A, L
11		profiles	A, E, K, L, M



<p>Hook</p> 	<p>Aluminium profile</p> 	<p>Plastic coated wire (galv.) and galvanized mounting material</p> 
<p>Enlarged strip (A)</p> 	<p>Plastic profile (B)</p> 	<p>Aluminium profile with hangers (C)</p> 
<p>Plastic coated wire (galv., stain.) and stainless mount. m. (D, F)</p> 	<p>Threaded bar (E)</p> 	<p>Profile connectors</p> 
<p>Stainless profile (G)</p> 	<p>Tensioner at blank end (H)</p> 	<p>Reinforced aluminium profile (I)</p> 
<p>Velcro (J)</p> 	<p>Galvanized chain (K)</p> 	<p>Screw tensioner in the profile (L)</p> 
<p>Grippler hangers - upper parts (M)</p> 	<p>Grippler hangers - lower part (M)</p> 	<p>Arch hanger of profiles (N)</p> 

# 4. Design Features

We offer a solution for every situation. Everything is tested by our qualified developers in a modern testing chamber. All products are custom-made and we are ready to meet your specific requirements for specific equipment or designs which are not listed here. Feel free to contact us.

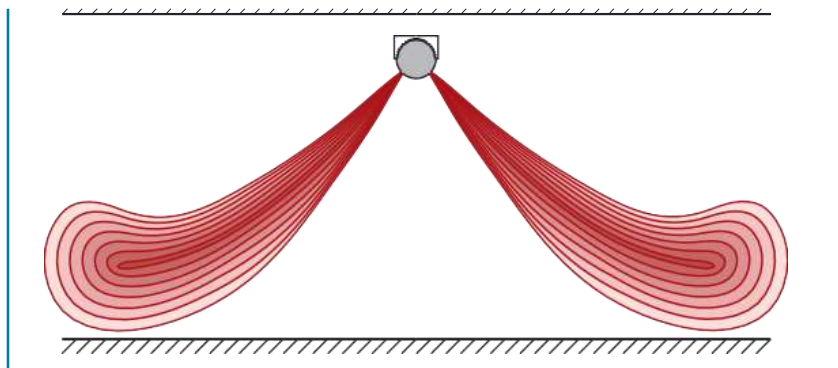
## 4.1. Products for special use

### Membrane Diffuser

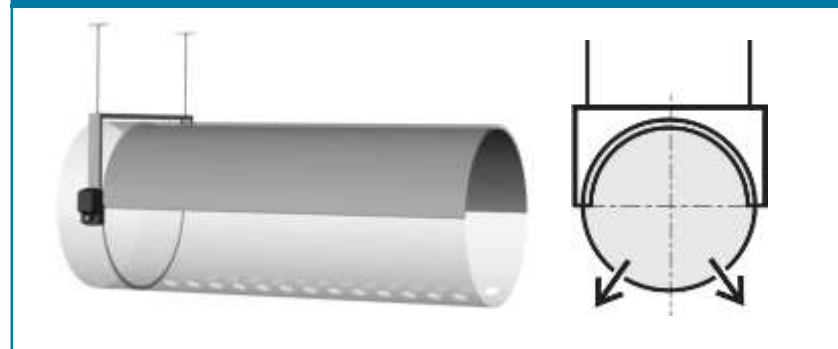
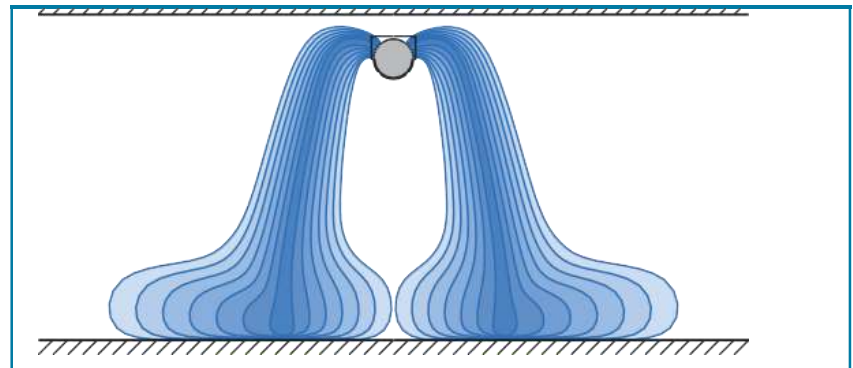
Diffuser for two different supply air modes

This combines two types of diffuser into one. The beginning of the membrane is a lightweight non permeable material sewn all along the duct length. The end of the membrane is attached to a flap, which is controlled by a servomotor or manually. In heating mode the motor moves the membrane to cover the cooling diffusers located at the top of the duct, the supply air exits the heating perforations on the bottom of the duct. In cooling mode the motor moves the membrane to cover the heating perforations at the bottom of the duct and the cool supply air leaves the perforations at the top of the duct. The membrane allows two totally different diffusion styles in one duct.

Heating



Cooling



#### FLAP

Used for switching between the two modes. It is made from Classic (PMS/NMS) or Premium (PMI /NMI) material, depending upon the duct specification; the internal spigot and external frame are made from galvanized steel. The length is always 400 mm. The flap includes a servomotor 220 V or 24 V or it is altered for manual control.

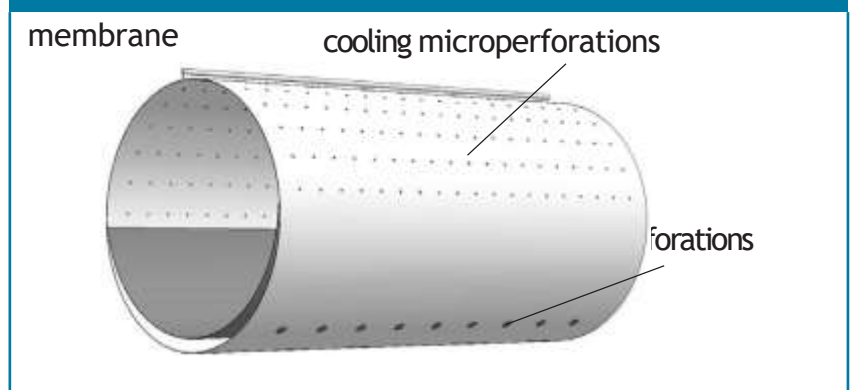
#### DIFFUSER

The membrane always covers one half of the diffuser and leaves the other open to supply air.

Detail of flap with servomotor



Scheme of membrane diffuser



Fabric Ducting for removing air

## Negative Pressure Ducting

We supply these only in square or triangular cross- sections. Because taught fabric is essential for extract ducting we tension the walls using a combination of suspension profiles, tensioning bolts and threaded bar. Air is drawn into the duct through perforations that can be positioned on any side and anywhere along the length of the duct. To ensure equal extract rates we can adjust the perforation diameters or the gaps between the perforations progressively along the duct. We anticipate our negative pressure ducts will be used where regular and/or thorough cleaning is required. Negative pressure fabric ducting is easily disassembled from the suspension system and unzipped into smaller washable parts. If NMI material is used, the ducting will be antibacterial.

Square fabric negative pressure ducting with a stretching structure



**IMPORTANT NOTE:** For impermeable fabrics Classic (NMS), Premium (NMI) a Durable (NMR) only.

## Insulated Ducting

Used for decreasing temperature loss during transfer of conditioned air to the diffusers. A 30 mm thick, loose fibre, insulating polyester material (classification of fire resistance B-s2,d0 according to EN 13501) is sewn between two layers of fabric ducting material. All of our fabric ducting materials are available for use as the outer layer of the insulated duct allowing an easy match with other parts of the system. The manufacturing process compresses the original 30 mm loose insulation layer by 20 mm, reducing the finished product wall thickness. The maximum duct heat transfer coefficient is 1.8 W/m<sup>2</sup>/K. Insulated duct is manufactured as standard in 2000 mm zipped lengths and starts from Ø250 mm upwards. There is one tyre every 1 m. Insulated ducting also acts as an excellent noise dampener, absorbing and reducing in duct noise vibration, contact us for specific details.

Thermal insulation

Insulated duct

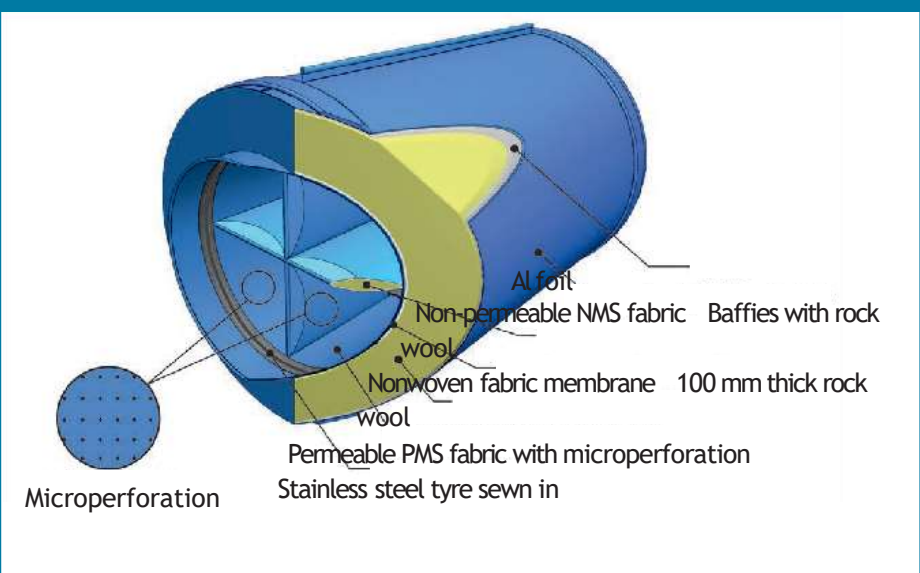


Noise attenuation

## Fabric Noise Attenuator - QuieTex

We use 100 mm thick rock wool with aluminium foil to manufacture the fabric noise attenuator, which is covered on both sides with fabric. Greater damping is achieved using microperforated fabric inside.

Construction of the QuieTex noise attenuator



Noise attenuation values in dB (for diameter 400)

Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Fabric noise attenuator	6	11	15	23	29	35	30	20





## Double Ducting

Condensation is mostly prevented by the use of double ducting. The interlayer is maintained in the correct position by a negligible flow of air (about 1 % of the ducting flow). The heat transfer coefficient reaches up to 3.5 W/m<sup>2</sup>/K.



## Lantern with Membrane

Original inside construction based on double walls and impermeable membrane allows switching direction of airflow. Air can be supplied either horizontally into all sides or vertically downwards, in both cases through perforated fabric. Switching can be controlled by servomotor or manually. Beside stainless steel wire of the switching flap all the rest is made of fabrics and can be cleaned in washing machine. The diffuser is very light and its installation requires fixing to air supply only.



## Antistatic Design

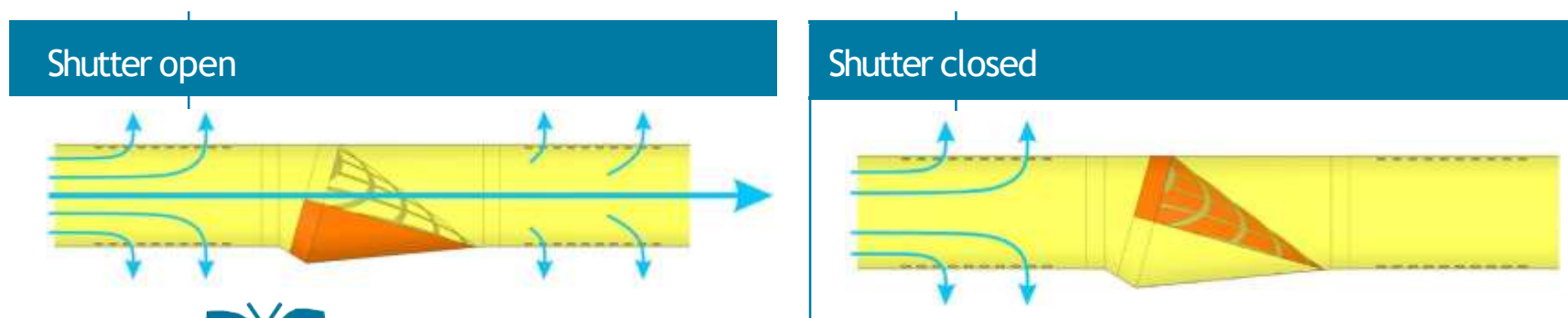
Antistatic design is intended for rooms, where a build up or uncontrolled discharge of static electricity must be avoided. Our Antistatic system consists of 4 measures:

1. A conductive fabric Premium (PMI, NMI)
2. A highly conductive strip installed all along the length of the duct
3. All zippers are equipped with metal joints
4. Earthing points at the ends of the duct



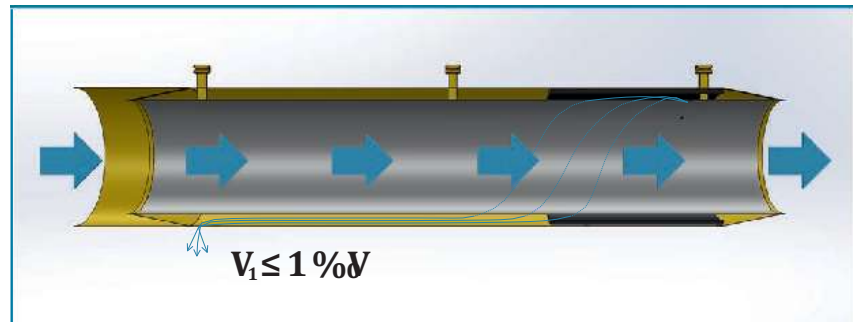
## Fabric Shutter

Fabric shutter closes whole cross-section of diffuser or ducting and avoids air distribution or air transport into area behind its location. It is made of fabric with removable inside metal construction of a thin rod. The internal conical membrane closes the cross-section with supporting fabric grill or leaves it open. It can be operated manually or by servomotor.



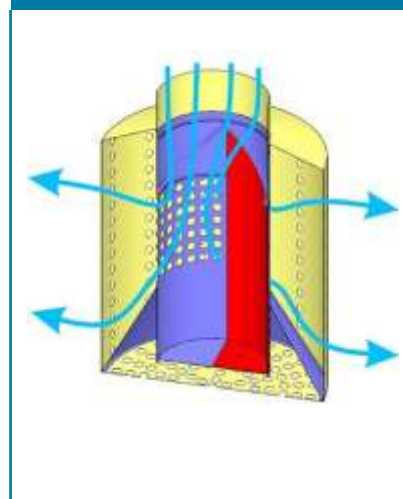
## Prevention of condensation

### Principle of Double ducting

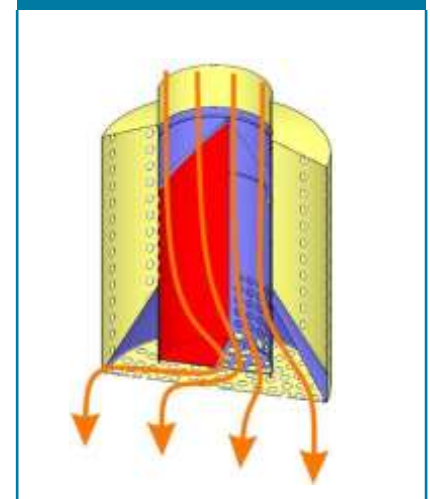


## Large volume diffuser

### Horizontal outlet

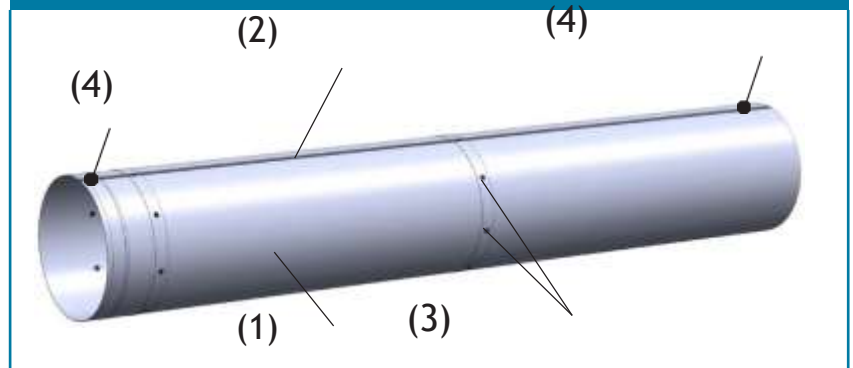


### Vertical outlet



## Removal of electrical energy build up

### Antistatic duct design features



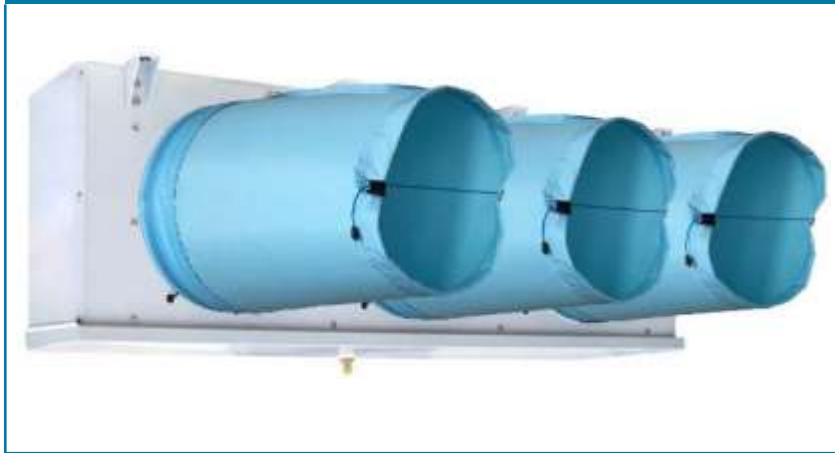
## Duct closing

## Defrost Damper

Faster and more efficient cooler defrosting

The Defrost Damper (DeDa) collapses over the evaporator fan face, blocking off the front of the cooler, this stops unwanted fan rotation and speeds up the process of defrosting. It is made of a light NLW fabric, which ensures a good cover of the cooler.

Defrost Damper on a cooler with fans running (1)



Defrost Damper on a cooler with fans not running (2)

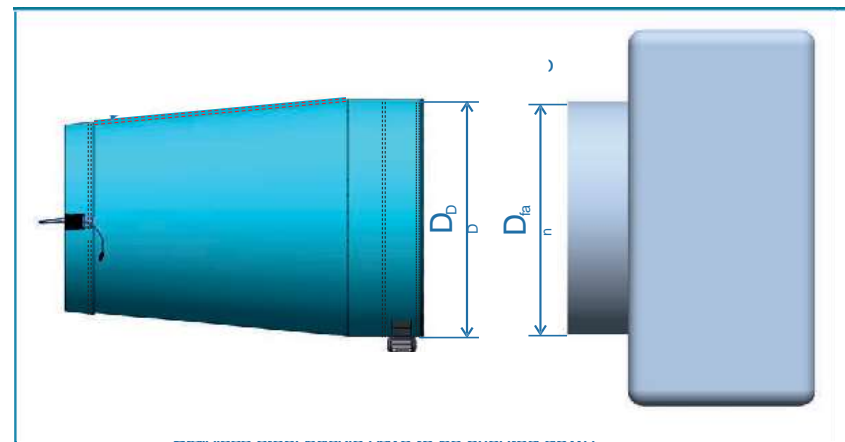


1. Whilst the fan runs the damper is open and supply air is flowing, although the air volume is slightly reduced by the damper. The flow rate through the cooler can become very slightly limited depending on the given ventilator characteristics and damper choking.

2. As a part of a defrosting shutdown of the cooler, the fabric should cover the ventilator, thus preventing air passage and accelerating the evaporator defrosting time.

3. The adjustable strap with a clamp allows for choking the damper. When being put into operation, it should be correctly tightened, making sure it effects the air flow as little as possible, while also preventing vibrations of the fabric.

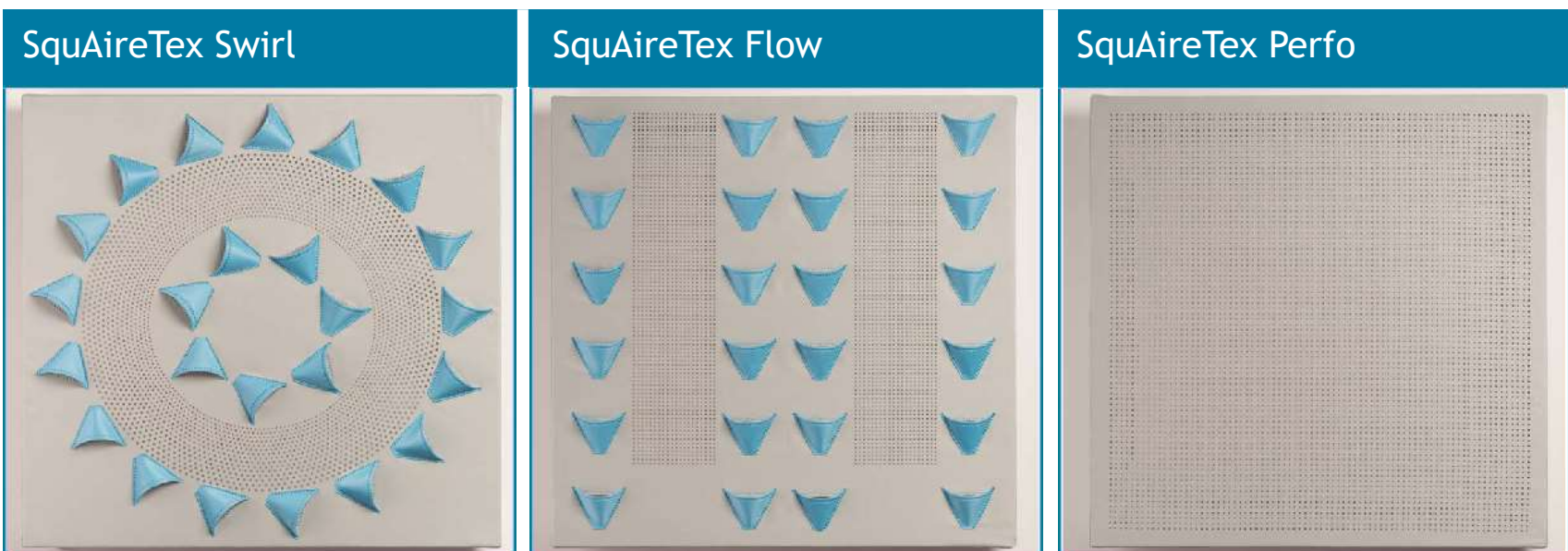
Defrost damper shape and installation



## Fabric Tiles SquAireTex ®

Fabric Tiles for walls and ceilings

SquAireTex fabric tiles provide a great solution for mixing of supply and ambient air. The construction is based upon fabric pockets which are sonic welded on to a fabric tile which is mounted upon a aluminium frame. SquAireTex diffusers are very easy to install as there is no fixing required. Thanks to its very low weight it can be laid directly into the false ceiling frame. The complete diffuser is easily removed from the frame for washing. 9 fabric colours are available which can be freely combined or any Prihoda Art motif. The connection box has been designed to optimise uniform air delivery and can be made from insulated material. There are 3 types of SquAireTex diffuser, Swirl, Flow and perfo all are described in more detail in their own special brochure...



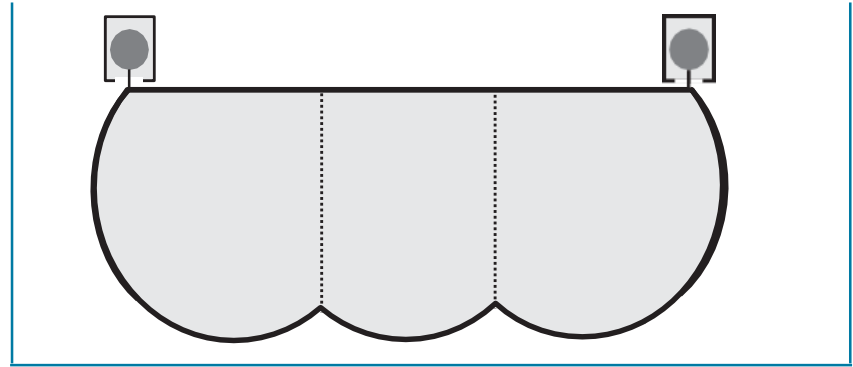


## Combined half-round section

This is a combination of several half-round diffusers sewn together side-by-side. It enables higher air volumes with a relatively small duct height.

High flow rate at low diffuser height

Example of combined half-round section



## 4.2. Solutions for long airflow distance

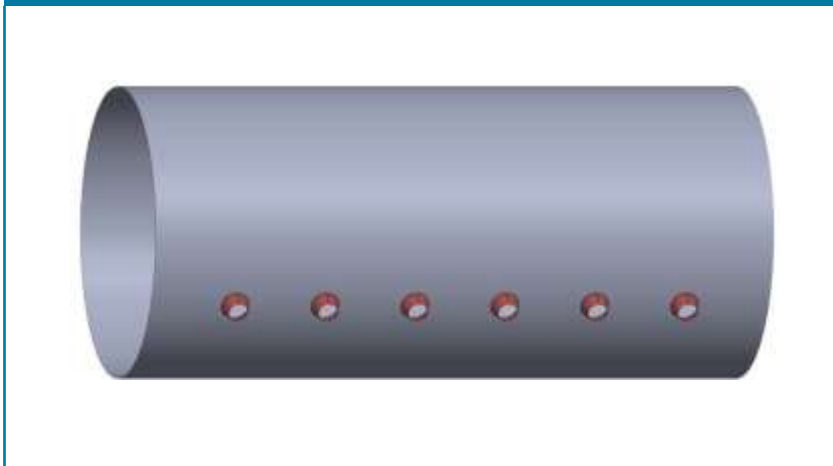
### Small Nozzles

For directed air patterns and long airflow distance

Small nozzles allow directed air patterns. Airflow is extended by circa 25 % in comparison to standard perforations and deflection minimized. The small nozzles exist in three diameters 20, 30 and 40 mm and in two variants, industrial and premium.

**IMPORTANT NOTE:** For fabric Classic (PMS, NMS), Premium (PMI, NMI), Durable (NMR), Recycled (PMSre, NMSre) only

Typical arrangement of small nozzles on the diffuser



Row of small nozzles

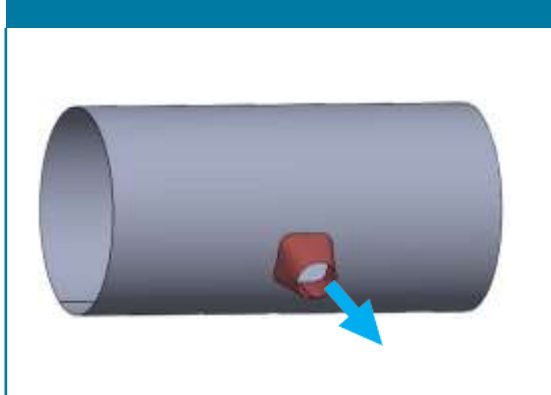


### Big Nozzles

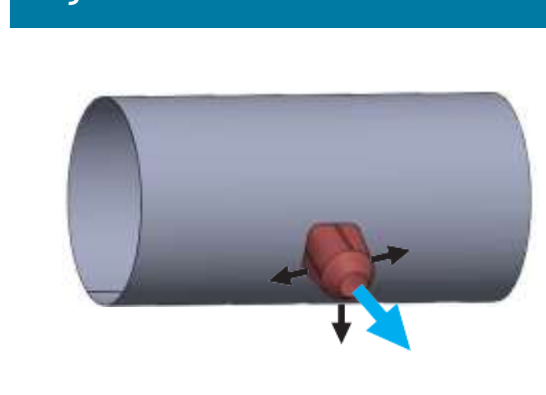
For Maximum airthrow distances

Our big nozzles (larger diameter) allow the longest airthrow distances. Range can exceed 20m depending upon static pressure and temperature difference. Nozzles can be fixed, adjustable or directed. Each of the nozzles has a very similar visual design; the adjustable nozzle may be directed as desired up to  $\pm 45^\circ$  using four belts which are hidden beneath an aesthetic fabric hem. An adjustable damper is sewn into every nozzle to allow variable flows.

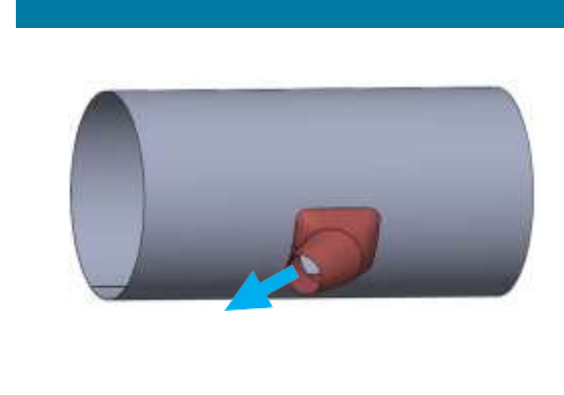
Fixed nozzle



Adjustable nozzle



Directed nozzle





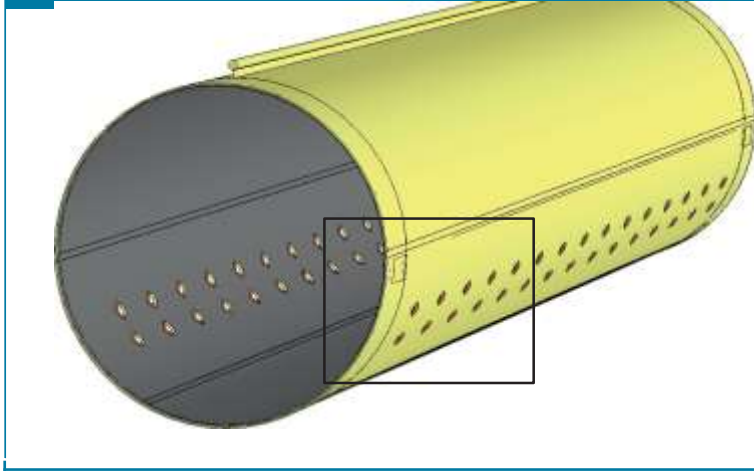
## 4.3. Products with adjustable parameters

### Adjustable Perforation

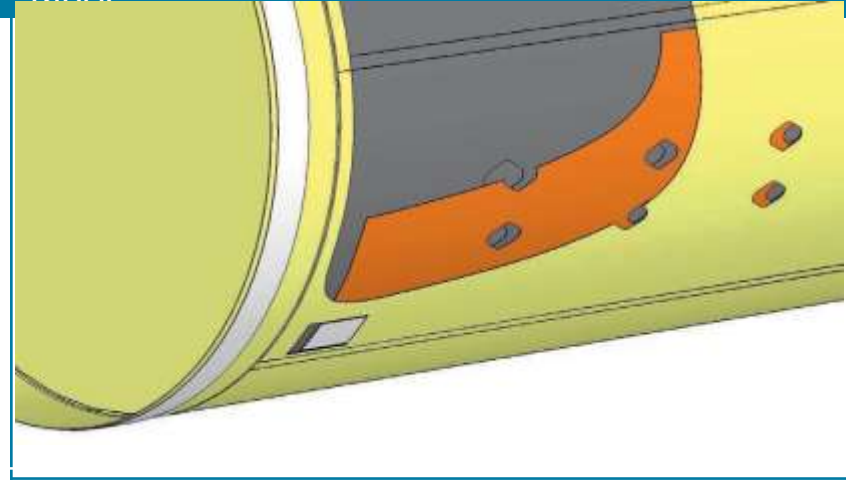
Setting airflow

It allows for manual for manual adjustment of the diffuser hole size and airflow. The pictures below describe the operation - actual diffuser sizes and hole patterns are completely variable depending upon the project requirements. The chosen position is retained using velcro.

Diffuser with adjustable perforation



The part with perforation is made of three layers of fabric



### Closable Nozzles

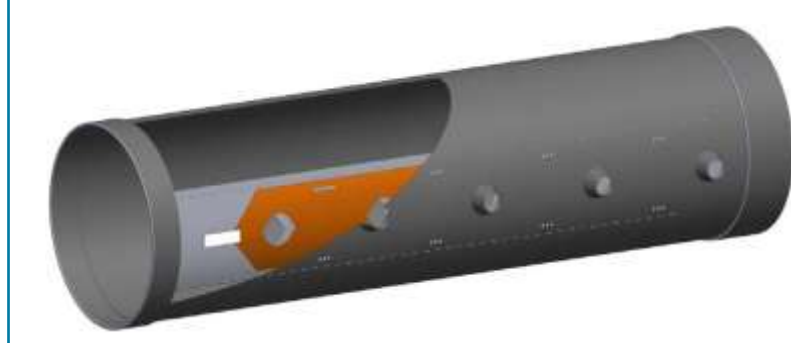
Regulation of air flow

Small nozzles can be blanked off by a band of perforated fabric placed behind the nozzles. The band moves between two fabric layers and opens or closes the nozzles. The required positioning is retained using velcro. If the nozzle is only partially opened, the flow is unstable and can change direction. The number of nozzles controlled by a fabric band is optional.

The maximum length of one closing band is 1,2m

Nozzle sizes	Maximum number of nozzles
20	7, flow 87m <sup>3</sup> /h at 100 Pa
30	5, flow 144m <sup>3</sup> /h at 100Pa
40	4, flow 210m <sup>3</sup> /h at 100Pa

Option to blank off certain nozzles

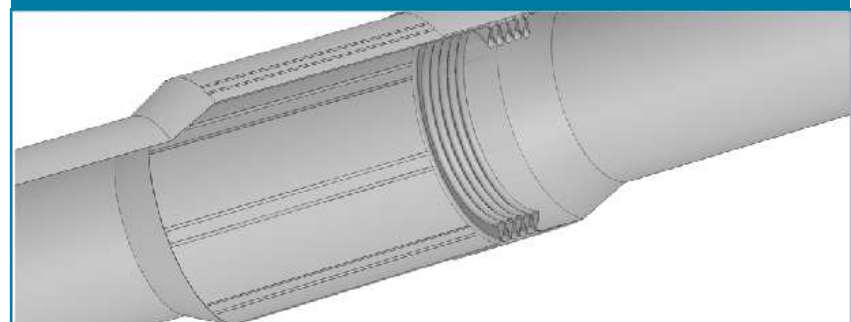


### Adjustable Length and Arch

Possibility to change length and angle during installation

Eight adjustable tie belts are sewn along the length of the circular duct. By adjusting (tightening or loosening) all or some of the eight belts, we can manually adjust the duct length or angle to suit the installation requirements.

Adjustable length - sectional view

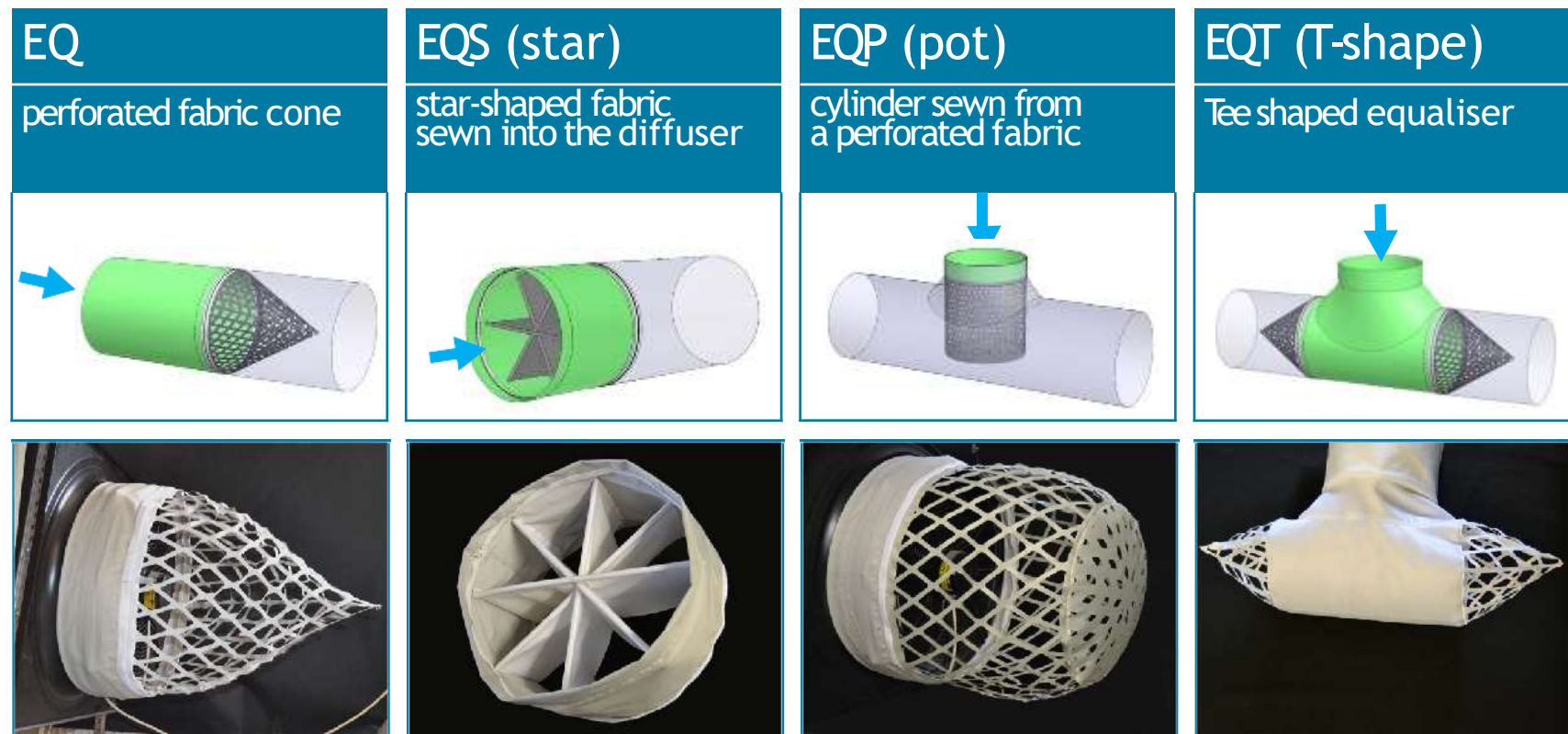


## 4.4. Solutions of problems with

### Equalisers

Airflow turbulence reduction

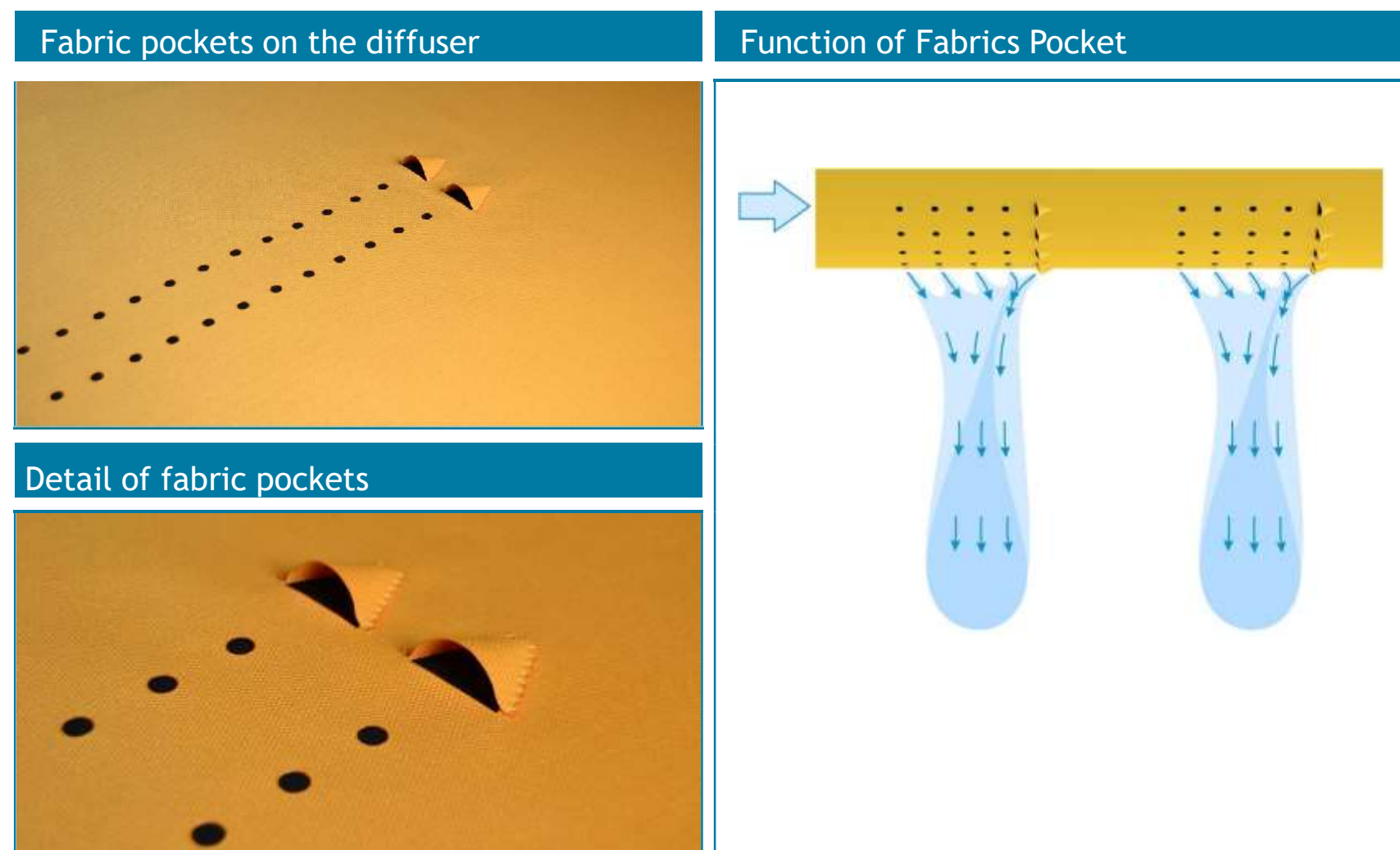
Equalisers are used downstream of the supply fan or inlet spigot. Their function is to reduce air turbulence and duct movement, however their use must be planned as they increase pressure drop.



### Pockets

Solution for deflection of flows from perforation

Fabric pockets are designed to remove the deflection of air leaving from the perforation. The solution is based on interaction of two air flows of similar momentum. Discharge from the last hole in the row is directed at a certain angle using a fabric pocket and balances the air deflection from perforation.







## Damper

The Damper is a short cone made of perforated fabric. The inlet of the damper is normal duct diameter whilst the outlet can be adjusted to a smaller diameter, by use of an adjustable belt. Maximum opening of the damper outlet results in zero pressure loss, whilst fully closing the outlet provides the highest local pressure drop. The damper setting can be adjusted at any time by opening a zip on the duct circumference. By installing a damper part way along the duct one can equalise the static pressure within the duct and therefore the air flowing from each point along the duct. We also use dampers to provide flow control through Fabric Nozzles and outlet spigots to other parts of a system.



## Diffuser for Intensive Cooling

For cooling applications with a  $\Delta t \geq 6^\circ \text{K}$  we recommend using horizontal air patterns from the Fabric Duct. This can be achieved by placing the micro-perforations in a band on either side of the duct at  $90^\circ$  and  $270^\circ$ . The horizontal airflow pattern must achieve a specific speed in order to prevent premature downward deflection. With sufficient outlet speed (provided by static pressure) it is possible to introduce 400 W of cooling capacity per 1 m duct length, whilst maintaining a velocity below 0.2 m/s in the occupied zone. The air flow patterns are detailed in the illustrations below, please contact our authorized representatives for specific applications.



## Anti-deflector

Anti-deflector prevents the deflection of airflow from fabrics micro-perforated with holes larger than the thickness of the fabric. It is made of a fine mesh and covers the diffuser from inside. Our calculation software recommends its use whenever deflection could occur.

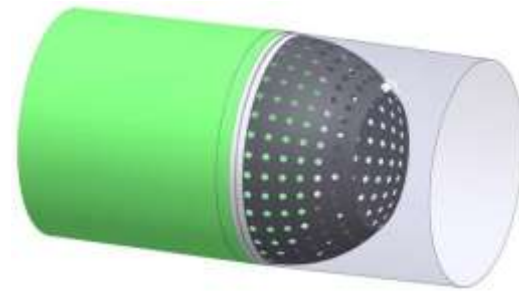


## Beat Absorber

The Beat Absorber is composed of three connected truncated fabric cones which eliminate the sudden impact of the supply air on the end of the Fabric Diffuser upon unregulated start up. This is available in new ducts and can also be retrofitted into existing systems.

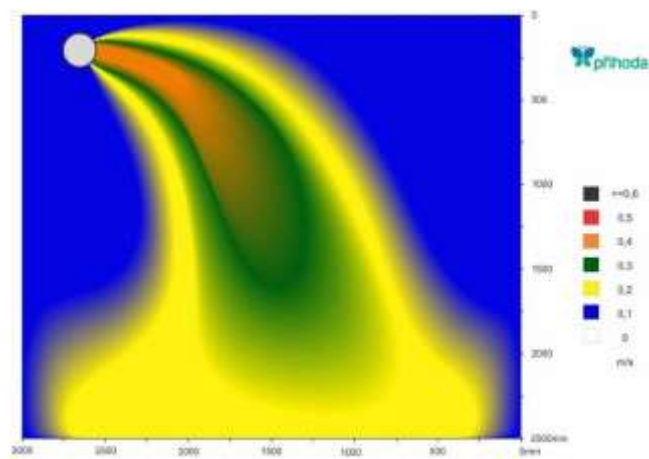
Equalising static pressure within a duct

### Damper



For cooling with a high temperature difference

Airflow patterns, microperforation  $90^\circ$ , 165 Pa



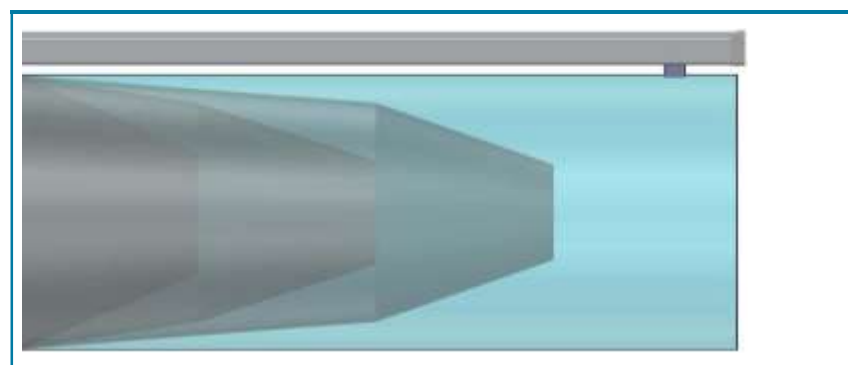
Prevents the deflection of airflow (micro-perforation)

Detail of diffuser with anti-deflector



Elimination of Airflow impact on diffuser's end

Beat Absorber is composed from three truncated cones





## 4.5. Appearance improvement

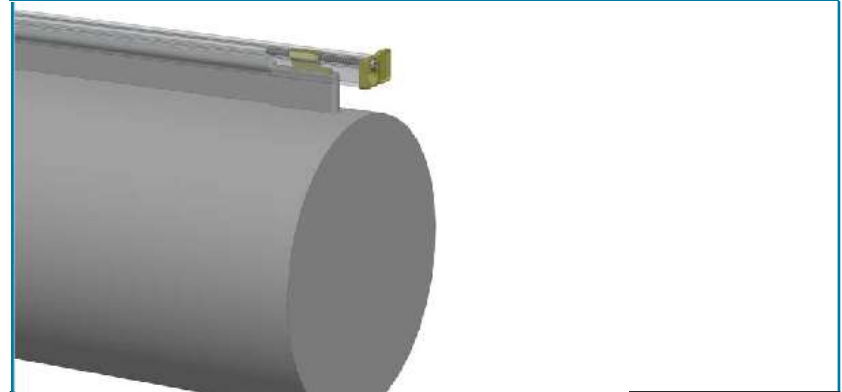
### Tensioner in the profile

Screw tensioners slide into the profile and are used to remove wrinkles and creases in the fabric. The flexibility of the fabric allows it to stretch by up to 0.5 %. Pre-stretched diffusers are therefore manufactured 0.5 % shorter than specified and the true length is achieved when tensioning. The installation procedure is specified in the assembly instructions included in all deliveries.

**IMPORTANT NOTE:** We recommend using tensioners whenever possible in all aluminium profile installations.

Straightening of small wrinkles

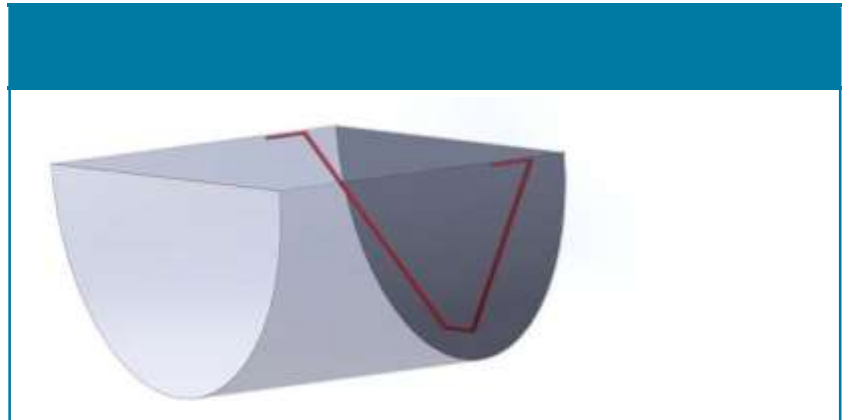
Principle of tensioner in the profile



Improved shape of blank end

### End Support

A metal spring wire tensions the plastic insert in the blank end improving the look of the end of the diffuser.



### End Tensioning

Anchored into the wall in the axis of the diffuser



Anchored into the wall or ceiling



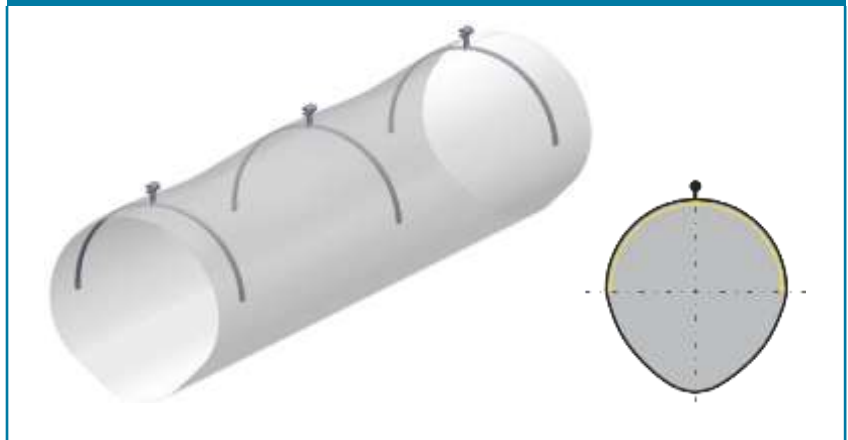
Stretches the whole length of the diffuser

Prevents textile from sagging

### Arcs

Used for improving ducting/diffuser shape without air inlet. Arcs ends are inserted into pockets sewn on the internal ducting wall; they are fastened in the middle by a Velcro attachment. They are disassembled during maintenance. It provides a cheaper alternative to tyres.

Diffuser with arcs without air supply



## Tyres

Made of a flat aluminum profile, a stainless steel wire or fire resistant plastic. Each material has its advantages and limitations. Only circular shapes can be made of plastic. Installed with appropriate spacing using Velcro fasteners which allows them to be dismantled during maintenance.

Maintains diameter

Circular diffuser with tyres

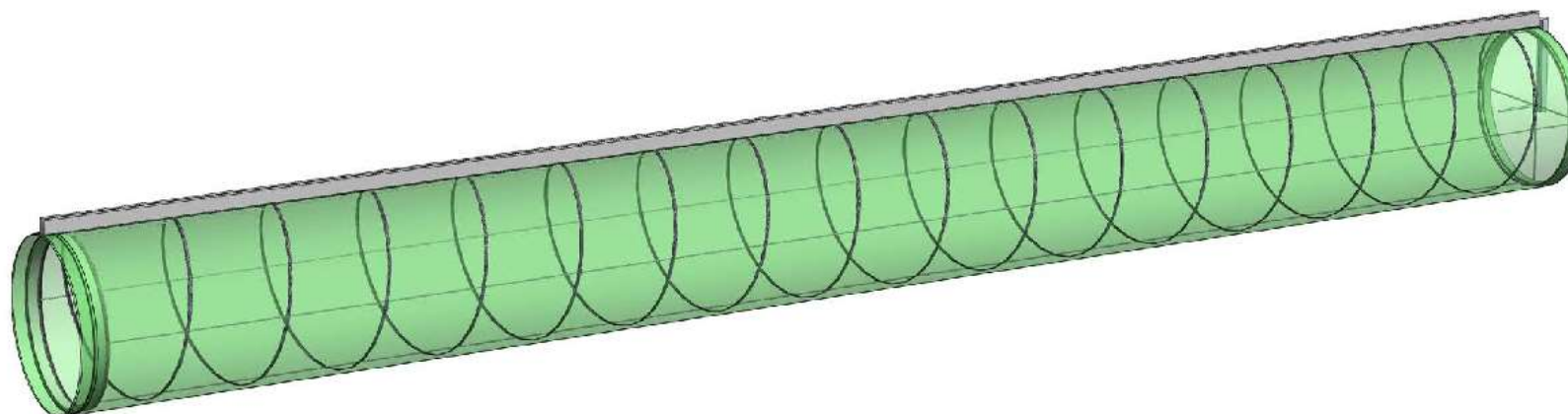


## Helix reinforcing system

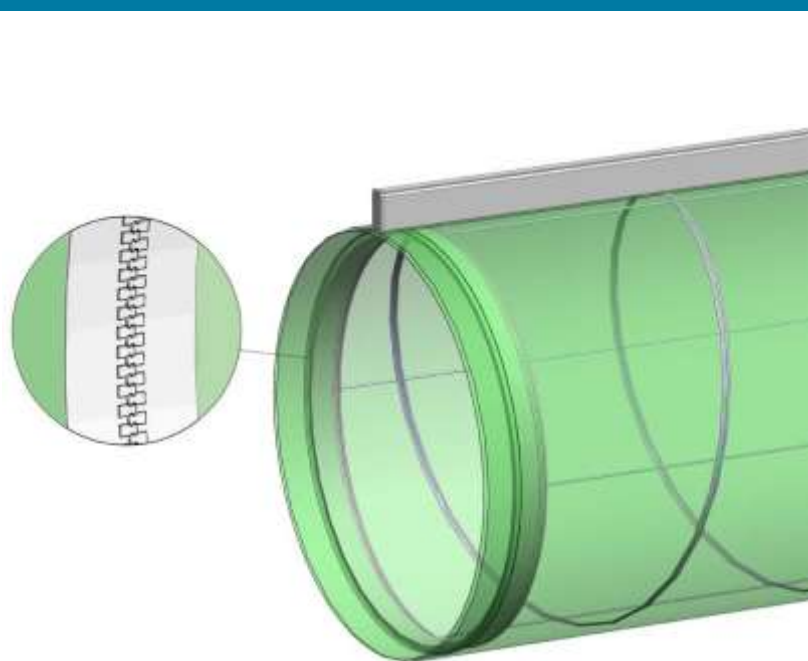
The fabric-covered metal spiral is inserted inside the duct; it maintains permanently its cylindrical shape and keeps the fabric stretched. The necessary lead of the spring is provided by longitudinal textile strips. Five-metre long Helix sections are connected to zip fasteners attaching separate sections of the ducting together. The spiral can be easily removed for maintenance purposes; its manufacturing design is suitable for a majority of shaped pieces. The necessary tension of the fabric will be achieved by the tensioners in profile and in blanking.

Straightening the shape

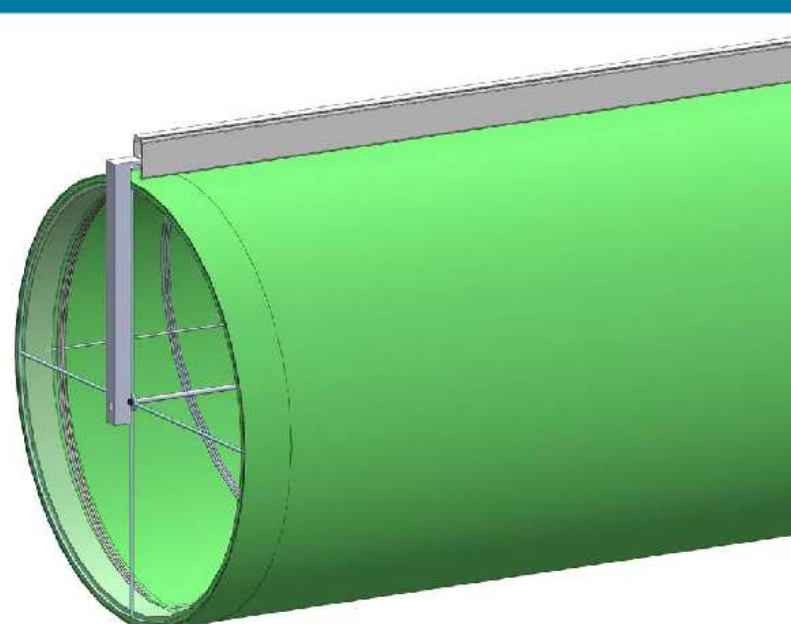
Helix reinforcing system



Detail of beginning



Detail of end



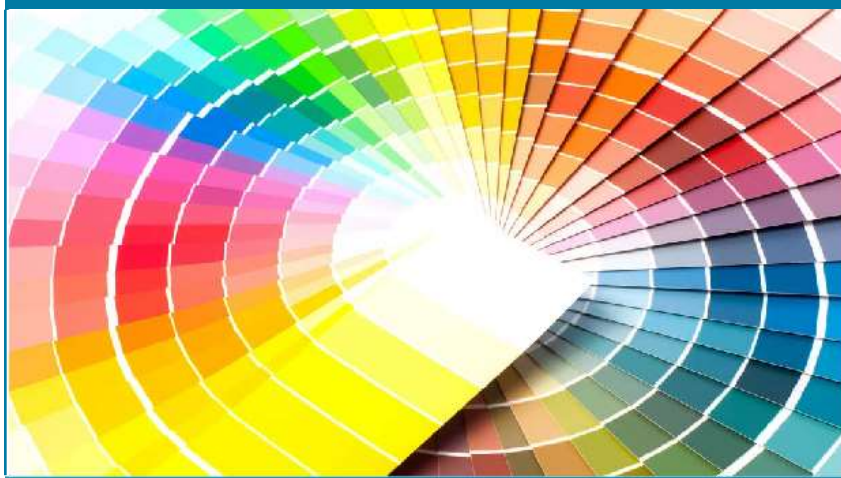


## Přihoda Art

Ducting doesn't need to be boring

Manufacturers of sheet-metal pipes do not offer the chance to display a company logo or themed photos, but Přihoda textile outlets give you this opportunity. Our fabric dyeing technology gives products a new aesthetic dimension, enabling them to become an interesting feature in any interior. We are able to produce textile outlets and air ducts in any Pantone colour, with any pattern, photograph, image, logo or inscription, regardless of how complex they are. We guarantee that the colours and images will not fade, even when washed regularly

Special colours



Structures of building materials



Logos



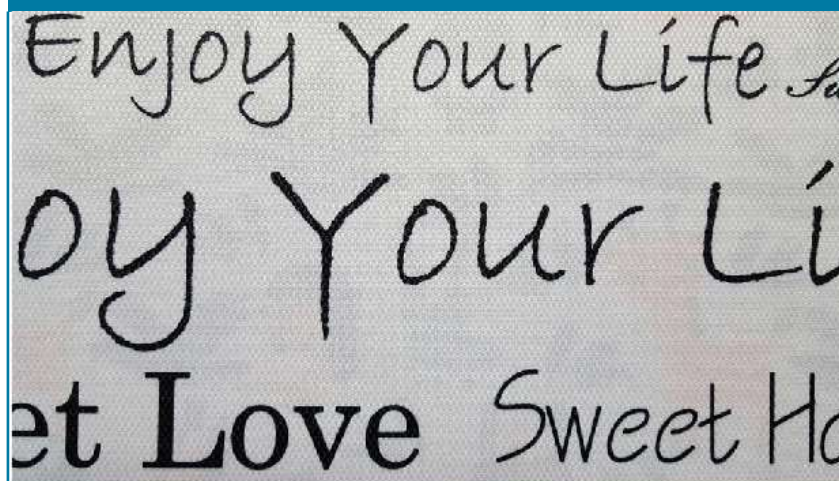
Patterns



Photos



Writings



Product photos



Illustrations

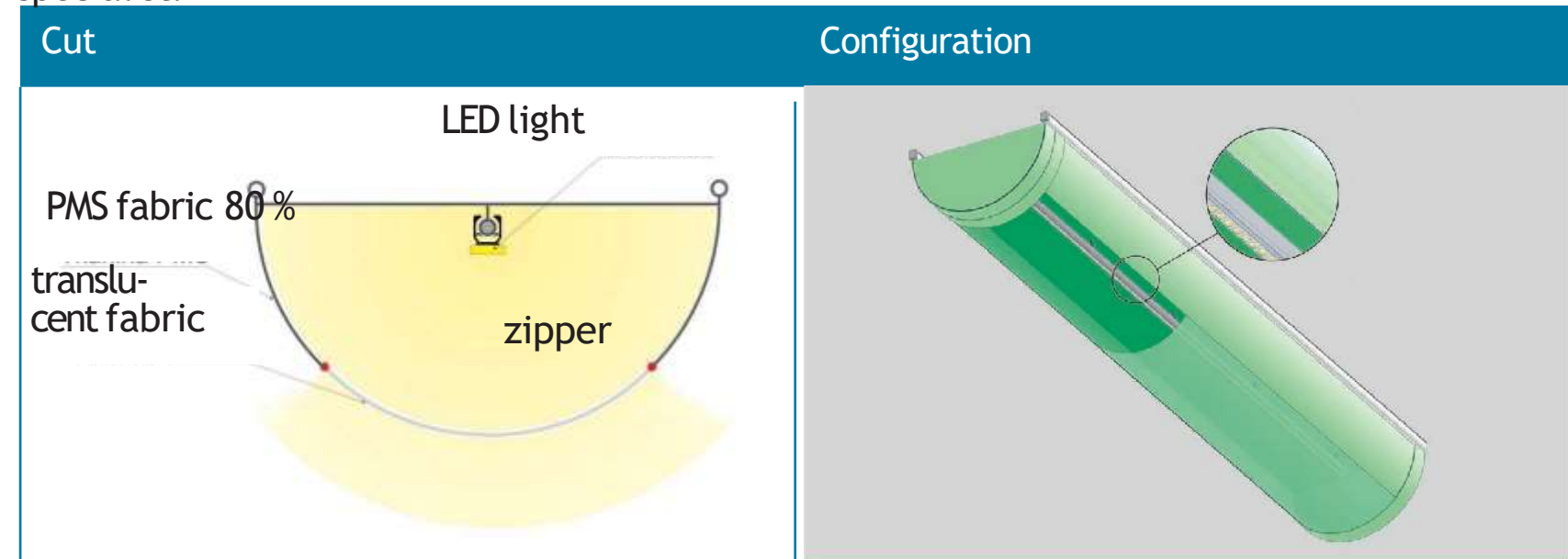




## LucentAir

Combination of lighting and ventilation

LucentAir diffuser combines air supply with room lighting. Fabric walls are partly made of highly light transmitting fabric (80%). These parts, usually strips, are connected by zippers to allow cleaning. Source of light (LED strips usually) is fixed on an aluminium profile inside of diffuser. We supply the hanging profile but not the light source. This has to be solved by a specialist.



## Office design

Details for improved appearance

Products marked in this way contain several details to improve their appearance. Office design means:

- Connection strips covered by fabric
- Plastic reinforcement of the blind ends
- At non-circular shapes the plastic reinforcements can be held in correct position by metal construction
- At non-circular shapes the blind ends have soft strips and additional piece of profile to cover up the gap between diffuser and ceiling/wall.
- Smallest possible number of fabric parts used i.e. minimum number of lengthwise seams

## 4.6. Mounting simplification

### Winch

The whole Fabric Duct can be installed from one end of the installation using a Prihoda winch. This significantly simplifies installation and removal. This system is particularly useful where the fabric ducts are mounted over swimming pools or technical machinery where access is limited.

**CONDITIONS OF USE:** The winch system is suitable for installations 5, 5D, 5F, 5I, 5DI, 5FI exclusively. Maximal weight of diffuser: 100 kg

Mounting and demounting from one place

Winch winding using approved site tools



# 5. Material

## 5.1. Important Benefits

As a company PŘÍHODA s.r.o. places tremendous importance on the quality of the materials used. In every case we use specially developed materials that have been subjected to extensive development testing in order to achieve maximum performance benefits for our customers. The Prihoda Premium (PMI/NMI) fabrics provide all the benefits listed below as part of our standard design (at no additional cost).

<b>High rigidity and strength</b>	Our basic Classic, Premium and Recycled (PMS/PMSre/NMS/NMSre/PMI//NMI) fabrics demonstrate optimum rigidity of 1800 N/10mm in the texture and 1000 N/10mm in the weave. These parameters make tearing of the material in normal use almost impossible.
<b>High fire resistance</b>	The PMI/NMI/PMS/NMS fabrics are certified to European standard EN 13501-1 with excellent results. In this test our fabrics achieve B-s1,d0 classification, which means prevention of spread of fire, minimum smoke production and no burning drops. Glass (NHE) fabrics in fact meet class A requirements. Classic, Premium and Recycled (PMI/NMI/PMS/PMSre) fabrics are also certified to US norm UL 723.
<b>Negligible fibre shedding</b>	Due to the use of endless fibres, ALL of our fabrics can be used in cleanrooms up to ISO Class 4. Independent laboratory tests demonstrate that there is practically no particle shedding from our material during operation.
<b>Antistatic effect</b>	Woven carbon fibre in Premium (PMI/NMI) and Durable (NMR) materials removes any build up of electric charge from the surface of the fabric.
<b>Antibacterial effect</b>	We utilise a special treatment which guarantees that no bacteria can survive if settled on to our fabric Premium (PMI/NMI) and Durable (NMR). This treatment remains effective after multiple washing. Tests for the European standards found that after TEN washes there was no reduction in the efficacy of the treatment. This allows us to offer a 10 year warranty on the basis of our minimal maintenance requirements (see the following point).
<b>Easy to maintain</b>	Our fabrics which are manufactured using endless fibres are very effective and minimize settlement of impurities from the supply air. This supply air is distributed through the diffuser perforations, and the Fabric Ducts remain relatively clean inside (in a normal environment). They do not require any other maintenance than outer dusting. Washing is normally only required for either hygiene or aesthetic reasons.
<b>Stable Appearance</b>	Thanks to our endless fibre technology, the appearance of the fabric does not change over time, or with multiple washing cycles, unlike materials made of basic fibres. Our Premium, Classic and Recycled (PMI/NMI/PMS/NMS/ PMSre/NMSre) materials remain aesthetic after many maintenance cycles.

Designation	Permeability	Weight	Material	Characteristic								
Prihoda Premium (PMI/NMI)	yes/no	medium	100% PES	●	B	●	●	●	●	9	●	●
Prihoda Classic (PMS/NMS)	yes/no	medium	100% PES	●	B	●	●	●	●	9	●	●
Prihoda Recycled (PMSre/NMSre)	yes/no	medium	100% PCR PES	●	B	●	●	●	●	9/4	●	●
Prihoda Light (PLS/NLS)	yes/no	light	100% PES	●	B	●	●	●	●	9	●	●
Prihoda Durable (NMR)	no	medium	100% PES	●	B	●	●	●	●	1	●	●
Prihoda Glass (NHE)	no	heavy	100% GL, 2x PUR	●	A	●	●	●	●	7	●	●
Prihoda Plastic (NMF)	no	medium	100% PES, 2x PVC	●	B	●	●	●	●	4	●	●
Prihoda Foil (NLF)	no	light	100% PE	●	●	●	●	●	●	1	●	●
Prihoda Translucent (NMT)	no	medium	90% PVC, 10% PES	●	C	●	●	●	●	1	●	●
Prihoda Hydrophobic (NLW) (only for DeDa)	no	light	85% PES, 15% NY	●	E	●	●	●	●	1	●	●

yes	no	●	●
-----	----	---	---

antibacterial	fire resistance (class)	antistatic	high strength	machine washable	suitable for clean rooms	number of standard colours	special colours/Prihoda Art	water repellent
---------------	-------------------------	------------	---------------	------------------	--------------------------	----------------------------	-----------------------------	-----------------

## 5.2. Selection of the most suitable material

### 1) Classic (PMS, NMS) or Premium (PMI, NMI)

Fabric Premium is unlike Classic in addition antibacterial and antistatic. Through these properties they are predetermined to use in the environment with the highest hygienic requirements or where it is necessary to prevent arising electric voltage between textile diffuser and earthing. Although the both categories reach usually the rank for the same class according to the flammability, fabric Premium are besides equipped with the special modification for minimization of combustion and fumes.

### 2) Air-permeable (PMS, PMI, PLS) or non air-permeable (NMS, NMI, NLS, NMR)

The only reason for usage of the air-permeable materials is need to prevent the water condensation on the surface of the diffusers. When in cooling with the temperatures under the dew point the non air-permeable material will behave like steel ducting and it is necessary to use air-permeable fabric, alternatively double or insulated ducting.

### 3) Light materials (PLS, NLS)

Their lower price is balanced with shorter warranty and life-time. Compared to other fabrics, these light materials are easy to wear out by washing and they will not last more than 50 washing cycles. Thanks to extreme low weight they are pleasant to touch in manipulation.

### 4) Foils and coated fabric - Foil (NLF), Plastic (NMF), Glass (NHE), Translucent (NMT)

They can't be washed in the washing machine, but on the other hand it is possible to clean them with the water flow and with wiping. Foils are the most convenient material with regard to price.

### 5) Recycled materials (PMSre, NMSre)

They are made of fibers gained through recycling of PET bottles and their usage will contribute to the protection of the environment. Every square meter of this fabric saves 13 PET bottles from the waste dump. Recycled materials are technically equal to category Classic.

### 6) Colour choice

Most materials are generally available in 9 colours, which roughly correspond to the following range. When using Prihoda Art technology (see page 22) any RAL or Pantone colour can be chosen, favourite motifs, company logos or photographs. It is suitable for all materials which are 100 % PES.





## 6.

# Maintenance and Warranty

All our ducting&diffusers are made from high quality and highly resistant materials without natural fibre additives. The material used is specified within the technical description of your order. If the diffuser/ducting is equipped with tyres, arcs or tensioning systems, these fixed components need to be taken out before washing.

## How to wash and clean fabric ducting&diffusers

### 1. Textile diffusers and ducts that can be washed in a washing machine

*Materials: Prihoda Classic (PMS, NMS), Prihoda Premium (PMI, NMI), Prihoda Light (PLS, NLS), Prihoda Recycled (PMSre, NMSre) Prihoda Durable (NMR), Prihoda Hydrophobic (NLW)*

- 1.1. Heavily polluted diffusers should be first dusted using a vacuum cleaner (compressed air, soft brush).
- 1.2. When the diffuser is more polluted inside, turn it to its reverse side prior to washing.
- 1.3. For machine washing use industrial detergents (dosing in accordance with the given manufacturer recommendations). Use washing programs for 40 °C, with spinning between 400-800 rpm and intensive rinsing.
- 1.4. Use washing agents for professional use (we can recommend some of them upon request), however, you can use regular washing detergents as well.
- 1.5. Repeat the washing cycle if necessary.
- 1.6. Should it be required by the given local operation regulations at the installation location, add a disinfection agent to the washing detergent. The chemicals in the disinfection agent must not affect the fabric. Dosing in accordance with the given manufacturer recommendations.
- 1.7. Dry and install the diffusers after washing. The air that passes through can be conveniently used for their complete drying. Fabric diffusers must not be dried in any dryer!
- 1.8. Surface (induction) dirt can be usually removed by a vacuum cleaner directly from the installed diffusers. We recommend using an extension with a brush.

### 2. Textile diffusers and ducts that cannot be washed in a washing machine

*Materials: Prihoda Plastic (NMF), Prihoda Foil (NLF), Prihoda Glass (NHE), Prihoda Translucent (NMT)*

- 2.1. Dirt can be usually sufficiently removed by a vacuum cleaner or compressed air from the outside as well as from the inside of the diffusers.
- 2.2. Should the vacuuming not be sufficient, clean the diffusers using a wet or dry sponge, soft rag or brush, depending on the given dirt type.
- 2.3. The diffusers can be also washed by hand in a washing agent solution and manually rinsed (maximal water temperature is 40 °C). Let the water drip and material dry after rinsing. Fabric diffusers must not be dried in any dryer! The air that passes through the diffusers can be conveniently used for their complete drying.
- 2.4. Surface (induction) dirt can be usually removed by a vacuum cleaner (we recommend using an extension with a brush) or by wiping using a wet rag directly on the installed diffusers.

## Legend for symbols

8	Machine wash at max. temperature of 40°C, normal mechanical action, normal rinse, normal spin cycle.
9	Light mechanical action, rinse at falling temperature, light spin, gentle machine wash, max. temperature 40°C.
t	Hand wash only, do not machine wash, max. temperature 40°C, handle gently.
o	Do not bleach product.
d	Do not dry the product in a rotary drum drier.
n	Iron at a max. temperature of 110°C, use caution when steam ironing.
m	Do not iron product; steaming and steam processing is prohibited.
U	Do not dry clean product, do not remove spots using organic solvents.
W	The product is safe to dry clean using perchlorethylene and all solvents specified under the symbol F.

Any maintenance must strictly follow the washing label symbols sewn into every section.

pos01-part01-of02  
**OP 182250**  
**High Tech-CM.1351**  
**NMI 100% polyester**  
 9 o d n U



**PŘIHODA s.r.o.**  
**Tailor-made**  
**Air Ducting&Diffuser**

Za Radnici 476  
 CZ 539 01 Hlinsko  
 tel.: +420 469 311 856  
 fax: +420 469 311 856  
[info@prihoda.com](mailto:info@prihoda.com)  
[www.prihoda.com](http://www.prihoda.com)

**Made in EU - Czechia**  
**in September 2018**

- Number of the position, part
- Order number at PŘIHODA
- Identification by customer
- Material
- Treatment symbols

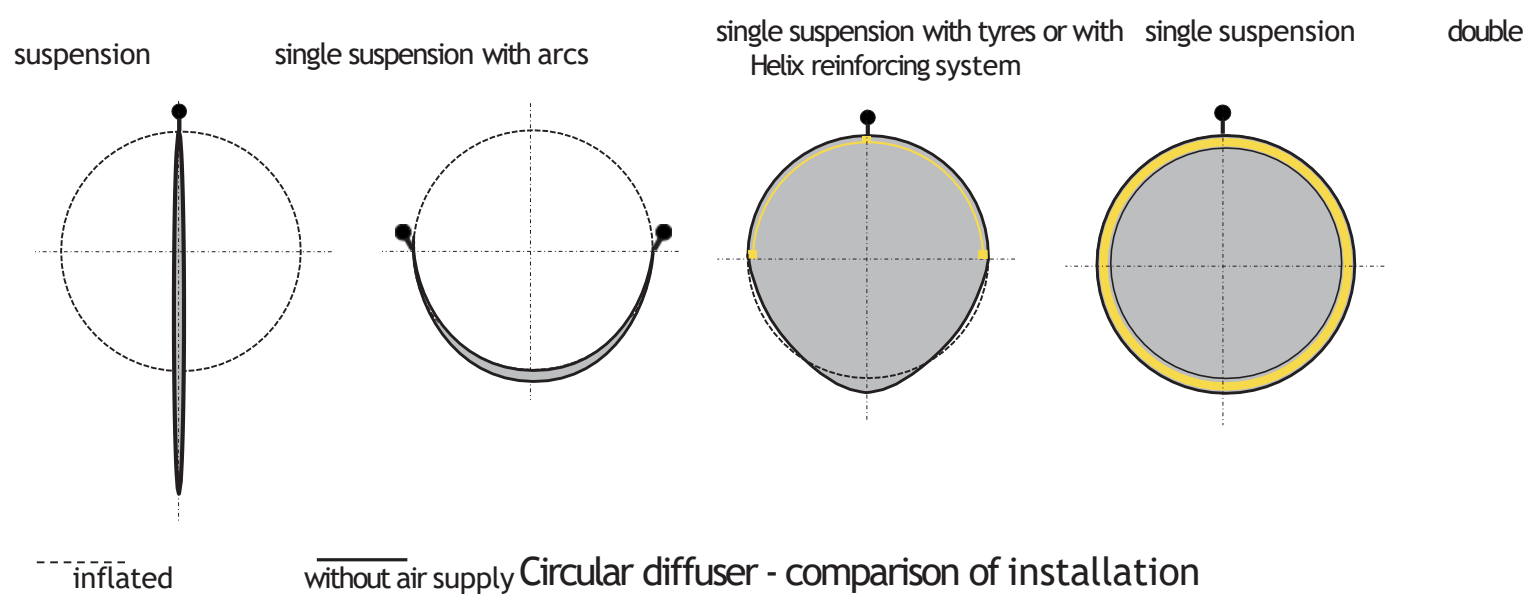
Manufacturer

Where and when it has been made

## 7.

# Frequently Asked Questions

## 1. What does a Fabric Duct look like when the fan is switched off?



## 2. Is it possible to use Fabric Ducting for extract (exhaust air)?

PŘÍHODA s.r.o. were the first manufacturer worldwide to introduce negative pressure ducting onto the market. It is made with a square or triangular shape. The principal is based on sufficient stretching of all ducting walls by means of a tensioning system. The construction enables simple disassembly and re-installation. Laser cut perforations are used to allow the air into the duct.

## 3. What is the service-life duration of Prihoda Fabric Ducts?

This is not a short term solution. Diffusers made from good quality fabrics will last for fifteen years or longer. Light fabrics (PLS, NLS, approx. 100 g/m<sup>2</sup>) with maximum permitted number of 50 washing procedure or the cheap, (usually polyethylene Foils (NLF) susceptible to tearing) may have limited durability.

## 4. What is the pressure loss of a Fabric Duct?

In a well designed straight diffuser there is an almost constant static pressure throughout. The fabric perforation is calculated based on the average value of the static pressure. In other words, the diffuser is designed based on the external static pressure of the system. Shaped pieces (bends) and turbulence equalisers present certain pressure loss which needs to be taken into consideration. Loss caused by friction is usually minimal due to the decreasing air speed inside the diffuser. The minimum utilisable pressure is 50 Pa, however Light material (PLS, NLS) will inflate from 20 Pa.

## 5. Is it possible to use square or rectangular diffusers?

PRIHODA s.r.o. has developed a special construction which enables use of a quadrangular cross-section. The principal is based on stretching the fabric in transverse and longitudinal direction by means of a tensioning system. The construction enables simple disassembly and re-installation. Fabric ducting with quadrangular cross-section can be assembled directly on the ceiling or suspended in the area.

## 6. What do you do with diffusers when they get clogged by dust or other contamination?

All of our products are easy to clean. Most of our fabric allow washing in a washing machine. Diffusers with perforations (holes larger than 4mm) will never get completely clogged by contamination. Our diffusers with Micro-perforations have considerably longer (more than double) period of operation between maintenance cycles than permeable fabric. usually cleaning is only necessary due to hygiene or aesthetic reasons. Each part of our system separated by zippers has a unique washing label which identifies its position and any washing instructions.

### 7. Can Fabric Ducts get mouldy?

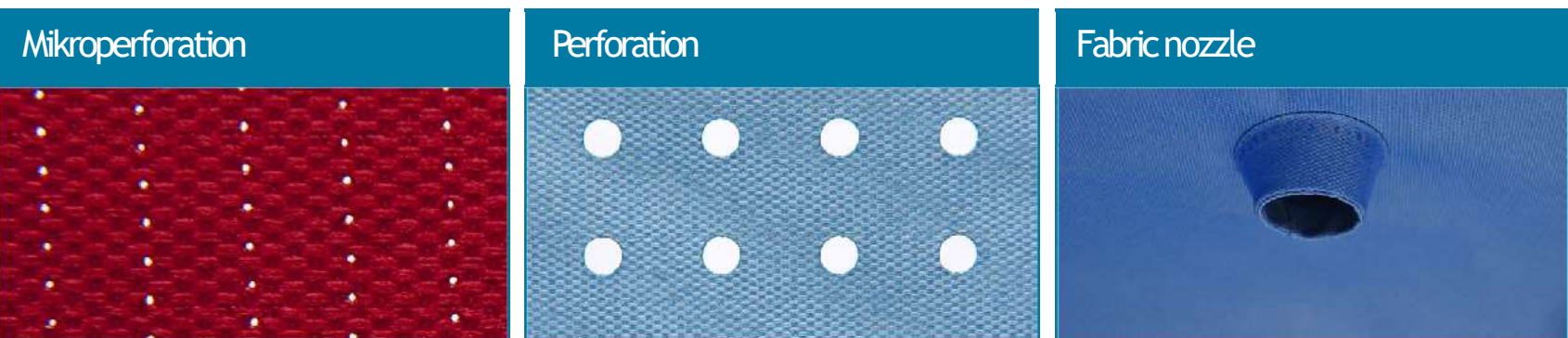
Mould can form on any kind of material if it is moist and unventilated. This goes also for most of our fabrics, including those with antibacterial finishing. Only one our fabric - Prihoda Plastic (NMF) - is mildew resistant. Never store moist diffusers and do not keep them out of operation for long periods of time, especially in moist atmosphere. Mould can cause indelible marks on the fabric.

### 8. Does the Fabric Duct function as a filter at the same time?

If permeable materials (PMS, PMSre, PMI, PLS) are used, the fabric functions as a filter for the part of the transferred air that goes through the fabric. As the fabric contamination gradually increases, the pressure loss grows and the air flow decreases. Therefore, it is necessary to wash the fabric. We consider the utilisation of microperforated or laser cut perforated fabric to be by far the best solution. Although perforated fabrics do not function as filters they do not change the pressure loss value and the number of necessary washing procedures significantly drops. We are a manufacturer of distribution (not filtering) ducts and diffusers.

### 9. Why doesn't PRIHODA use plastic nozzles or slots?

Use of plastic nozzles or longitudinal slots were a historical necessity. These tools used to enable certain air distribution patterns, the nozzles in addition protected the frayed edges of the holes. When we began to use laser technology that allows cutting of accurate holes with sealed margins, they became redundant. Correctly designed rows of laser cut holes fulfil the same purpose, whilst being cheaper and more aesthetic. We use fabric nozzles for longest air flow and vertical outlet of air, never plastic nozzles. Our fabric nozzles are light weight and sonic welded to the material they will not fall out of the duct or damage the duct through friction during washing.



### 10. Why doesn't PRIHODA use more permeable fabrics?

We use permeable materials to avoid condensation where supply air temperature is below dew point. However, we only have material of a single permeability value. It is very low and serves just to prevent condensation. Distribution of air is done exclusively using holes (perforation or microperforation or a combination of both) and adjusted holes (nozzles, pockets). Our product portfolio also includes non permeable materials, which are often useful in other situations.

### 11. Which certificates do Prihoda fabric diffusers have

Our materials are certified for fire resistance in accordance with EN 13501-1 (in various classes depending on materials) and the american UL 723. The PRIHODA company has a certified quality management system in accordance with ISO 9001 and an environmental management system in accordance with ISO 14001. Prihoda's fabric diffusers also obtained an Oeko-Tex certificate.





8.

# Examples of Applications

## Food processing industry

The first fabric diffusers were used in the food industry. Sanitary regulations require that all food processing devices should be easily sanitised and cleaned. Out of all the air distribution system options, this condition is only met by Fabric Ducting. Fabric Ducts are perfectly clean after washing and a disinfecting agent can also destroy any pathogens that may resist the antibacterial treatment. Fabrics made of endless fibres, developed especially for Prihoda's textile diffusers, are very smooth and do not allow the build up of impurities. This unique and special feature distinguishes them from diffusers made of staple fibres that continuously trap dust and can represent a sanitary risk.



## Supermarkets, exhibition and large retail areas

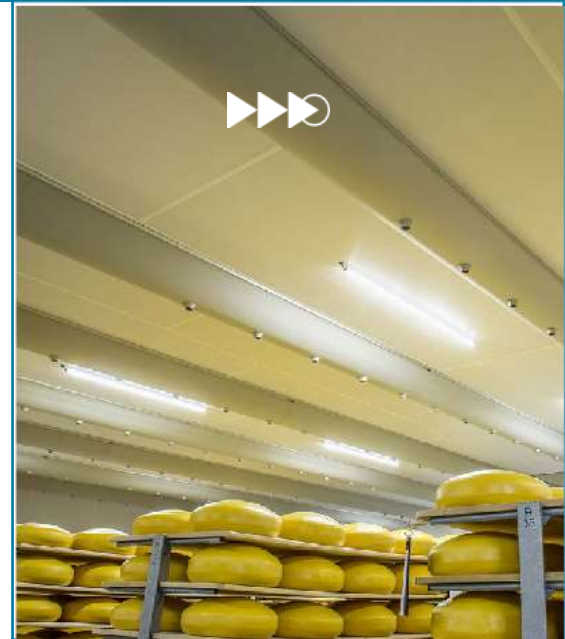


For large retail areas we can provide supply air through laser cut perforations or nozzles, whichever suits the application best. Experience over many years shows that Fabric ducting & diffusers offers a substantially better, more uniform air pattern than can be achieved with traditional systems, whilst also offering substantial cost savings. The wide range of 9 stock colours allows for many different aesthetic designs whilst the Fire Resistance of our fabrics meet all world wide standards.



Food Stores, Low Temperature Production Areas

In large cold stores Prihoda Fabric Ducting distribution systems provide uniform air distribution, ensuring maintenance of stable product temperatures and temperature zones. In production zones with large amounts of people working in low temperatures, high air velocity will be a major cause of discomfort and may cause a higher sickness or absence rate. Fabric ducts and diffusers disperse cold air without causing draughts, and create comfortable, low velocity environments for workers.



Chemical, Textile and Electronics Industries



Prihoda Fabric Ducting air distribution is a perfect solution for any industrial operation. Prihoda Fabric Ducts provide uniform low velocity air distribution or targeted air patterns, at unbeatably low costs. Over 100 suspension solutions make it possible to choose a convenient installation style for any application, easily accommodating most suspended and formed ceiling types. Contaminated production environments may require the use of fabrics with larger laser cut perforations.



Pools, Sports Halls and Fitness Centres

Large sports facilities are a typical application for Prihoda Fabric Ducting & Diffusers, we are able to create a large range of diffusion air patterns to suit any project. Whilst our many installations at sports and fitness centres provide comfortable cooling air movement for customers 'working out'. In these applications low ceiling heights are often encountered, where half round fabric ducts make an aesthetic and functional low cost installation solution. Swimming Pools are a major user of Fabric Ducts, where the fabric material copes easily with the harsh environment at a fraction of the cost of treated and insulated rigid systems. The bright colours available revive and enhance many swimming pool interiors.



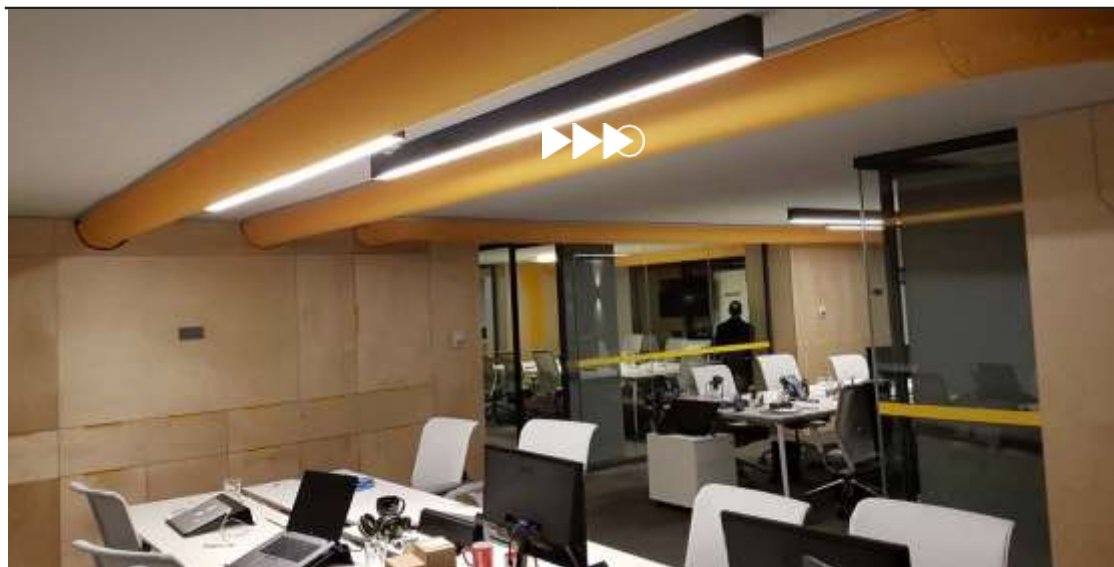


## Kitchens

Space in kitchens is usually minimal, and their extreme load with heat and vapours requires intense ventilation. Prihoda Fabric Ducts disperse high volumes of air uniformly into this environment without creating draughts. The fabric material used is resistant to steams and vapours and maintenance is very quick and easy. Compared to a traditional stainless steel installation Fabric Ducting is a much lower purchase, installation and maintenance cost and easily achieves sanitary and hygiene demands due to its cleanability.



## Offices, Restaurants, Cinemas etc.



Higher aesthetic demands can be satisfied by the multiple colour and shapes available with Prihoda Fabric Ducting air distribution. Correctly manufactured and perfectly installed fabric diffusers become an elegant part of an interior. Air diffusion through Fabric Ducting provides similar results to chilled beams or perforated ceilings, however although the performance is similar, Fabric Ducting is available at a much lower capital cost. Unlike the traditional diffusers, embedded in soffits, our broadly diffused solutions do not cause any local heat discomfort. Experience has demonstrated that employees in such equally distributed and cooled offices are significantly more comfortable.

## Temporary Installations



The benefits of using Prihoda Fabric Ducting and distribution systems for cooling or heating of large scale tents or other temporary structures are self evident. Light weight roof structures can easily support fabric ducting and diffusers weighing from 100 to 400 g/m<sup>2</sup>. Installation is very quick, using the supporting wires and hooks provided as part of the system. Top quality materials allow multiple repeated use. Cooling or heating using a large AHU and Fabric Ducting diffusing all along the structure, is much more economical than simply blowing the air into a space. Specifically with heating the warm air rises quickly creating a high temperature zone high in the ceiling and enormous heat loss. In cooling, with air diffused through Fabric Ducting intense airflow causes local air current and draughts; whilst else where zones with insufficient cooling develop. Both cases are successfully resolved by a properly designed Fabric Ducting distribution system.



## Tailor-made air ducting&diffusers

We are a medium-sized, Czech company that is fully specialised in producing textile ducting and diffusers designed for transporting or distributing air. We have production facilities in Czechia, China and Mexico. We don't make ducting by the metre, instead we provide a tailor made solution.



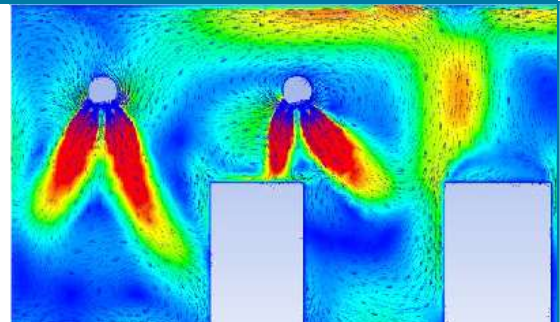
## More intelligence in air distribution

Fabric ducting and diffusers provide a series of excellent technical benefits. These include draft-free air supply, even air-flow distribution, maximum induction or, conversely, low-speed air supply throughout. In addition, customers can choose any shape, size or colour scheme, including graphic motifs.



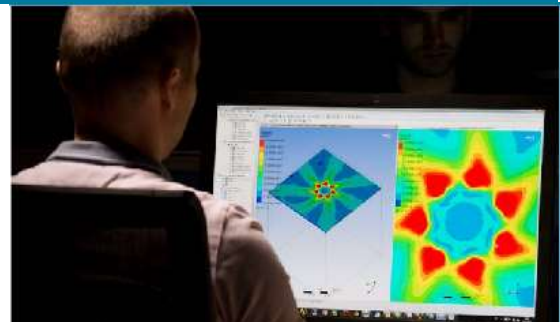
## Customised solutions for every operation

We are able to simulate air flow in our customers' premises and suggest a suitable product. Our knowledge and years of experience allow us to put hundreds of technical details together so as to ensure the best result. Our expertise in air flow in pipes ducts and in space is what our work is all about.



## The widest range of products thanks to innovation

In terms of fabric systems for the transport or distribution of air, there is practically no equipment or technical solution that we cannot manufacture. We have launched a range of completely new solutions and own several patents. We welcome comments from our customers, which we see as an opportunity to improve our services and perfect our products.



## Contact us

Our products are supplied through a network of authorised, trained representatives who cover almost the entire world. To streamline communication with our customers we have developed our own Air Tailor software that enables orders to be specified precisely and down to the finest detail.



PŘIHODA s.r.o.  
Za Radnicí 476  
539 01 Hlinsko  
EU - Czechia  
tel.: +420 469 311 856  
fax: +450 469 311 857  
[info@přihoda.com](mailto:info@přihoda.com)  
[www.přihoda.com](http://www.přihoda.com)



# EURO CERT group

The Certification Body for Management Systems Certification No. 3115, accredited  
by the Czech Accreditation Institute according to ISO/IEC 17021-1:2015

## Appendix No.1 to Certificate No. 5471/2016

### The list of certified locations:

#### Head office:

Za Radnicí 476 539 01 Hlinsko

#### Locations:

Wilsonova 579 539 01 Hlinsko

Karlova 1688 539 01 Hlinsko

Karlova 693 539 01 Hlinsko



Roztoky, 23.9.2016

Ing. Dagmar Pastyříková  
Head of Certification Body





# Centrum stavebního inženýrství a.s.

Fire Technical Laboratory

AUTHORIZED  
BODY No. 212

NOTIFIED  
BODY No. 1390

## CLASSIFICATION OF REACTION TO FIRE IN ACCORDANCE WITH ČSN EN 13501-1+A1:2010

**Applicant:** Příhoda s.r.o.  
Za Radnicí 476  
539 01 Hlinsko  
Czech Republic

**Prepared by:** Centrum stavebního inženýrství a.s.  
Pražská 16  
102 00 Praha 10  
Czech Republic

**Product name:** INSULATION

**Classification  
report No.:** PK-16-068

**Issue number:** 1/2

**Date of issue:** 30<sup>th</sup> May 2016

This classification report consists of 4 pages and may only be used or reproduced in its entirety.

Address:  
PRAŽSKÁ 16, 102 00 PRAHA 10, Czech Republic, E mail: [csias@csias.cz](mailto:csias@csias.cz), <http://www.csias.cz>  
Reg. No. 45274860, VAT No. CZ45274860. The Company is registered in the Commercial Register administered by the Municipal Court of Prague (section B, inset 1595).  
Fire Technical Laboratory, E-mail: [ptl@csias.cz](mailto:ptl@csias.cz)  
Phone: +420 281 017 111, Fax: +420 281 017 455



## 1. DETAILS OF CLASSIFIED PRODUCT

### Nature and end use application:

The product *INSULATION* is defined as a type of thermal insulation product according to CUAP N°12.01/16.

### Description:

The product *INSULATION* is fully described in the test reports in support of the classification listed in clause 2.

## 2. TEST REPORTS AND TEST RESULTS IN SUPPORT OF THIS CLASSIFICATION

### Test reports

Name of laboratory	Name of sponsor	Test report ref. no.	Test method
CSI a.s., Fire technical laboratory	CSI a.s., Notified Body No. 1390	14949 – 2/2 14950 – 2/2	EN ISO 11925-2
		14949 – 1/2 14950 – 1/2 16/330/P080	EN 13823

### Measured values and test results

Test method	Parameter	Number of test	Results	
			Continuous parameter mean (m)	Compliance parameters
EN ISO 1925-2 Appendix A thickness = 60 mm	$F_s \leq 150$ mm ignition of the filter paper	6 6	yes no	yes (B to D) no (d0)
EN ISO 1925-2 Appendix A thickness = 180 mm	$F_s \leq 150$ mm ignition of the filter paper	6 6	yes no	yes (B to D) no (d0)
EN 13823 thickness = 30 mm	$FIGRA_{0,2 MJ}$ (W/s)	1	5,1	$\leq 120$ (B)
	$LFS < edge$	1	yes 0,8	yes (B)
	$THR_{600 s}$ (MJ)	1		$\leq 7,5$ (B)
EN 13823 thickness = 60 mm	$SMOGRA$ ( $m^2/s^2$ )	1	0	$\leq 30$ (s1)
	$TSP_{600 s}$ ( $m^2$ )	1	10,0	$\leq 50$ (s1)
	flaming droplets / particles	1	no	no (d0)
EN 13823 thickness = 60 mm	$FIGRA_{0,2 MJ}$ (W/s)	3	30,6	$\leq 120$ (B)
	$LFS < edge$	3	yes 3,4	yes (B)
	$THR_{600 s}$ (MJ)	3		$\leq 7,5$ (B)
EN 13823 thickness = 60 mm	$SMOGRA$ ( $m^2/s^2$ )	3	0	$\leq 30$ (s1)
	$TSP_{600 s}$ ( $m^2$ )	3	28,9	$\leq 50$ (s1)
	flaming droplets / particles	3	no	no (d0)
EN 13823 thickness = 180 mm	$FIGRA_{0,2 MJ}$ (W/s)	3	80,8	$\leq 120$ (B)
	$LFS < edge$	3	yes 7,2	yes (B)
	$THR_{600 s}$ (MJ)	3		$\leq 7,5$ (B)
EN 13823 thickness = 180 mm	$SMOGRA$ ( $m^2/s^2$ )	3	17,0	$\leq 30$ (s1)
	$TSP_{600 s}$ ( $m^2$ )	3	153,9	$\leq 200$ (s2)
	flaming droplets / particles	3	no	no (d0)

### 3. Classification and direct field of application

---

#### Reference and direct field of application

This classification has been carried out in accordance with the clause 11.6, 11.9.3. and 11.10.1 of ČSN EN 13501-1+A1:2010.

#### Classification

The product *INSULATION*, in relation to its reaction to fire behaviour is classified:

**B**

The additional classification in relation to smoke production is:

**s2**

The additional classification in relation to flaming droplets/particles is:

**d0**

The format of the reaction to fire classification for *INSULATION* is:

Fire behaviour		Smoke production			Flaming droplets	
B	-	s	2	,	d	0

**Reaction to fire classification: B-s2, d0**



### Field of application

This classification is also valid for the following product parameters:

- Thickness: 30 to 180 mm

## 4. LIMITATIONS

---

### Restrictions

This classification report is valid until 30<sup>th</sup> May 2021, provided that the technical specifications of the product will not be changed.

### Warning

This document does not represent type approval or certification of the product.

Prepared:  Reviewed:

  
.....  
Jiří Socha

  
.....  
Vít Slaboch  
technical manager of laboratory



CE



# UYGUNLUK ONAYI ATTESTATION OF COMPLIANCE

<b>Reference No:</b> <i>Referans Nu.:</i>	<b>TRA-21-0056-04</b>
<b>Applicant:</b> <i>Başvuru Sahibi:</i>	<b>Technowell Mühendislik İklimlendirme Sanayi Ticaret Anonim Şirketi</b> <i>Şerifali Mah. Türker Cad. No:51 İç Kapı No:2 Ümraniye, İSTANBUL / TURKEY</i>
<b>Manufacturer:</b> <i>Üretici:</i>	<b>Technowell Mühendislik İklimlendirme Sanayi Ticaret Anonim Şirketi</b> <i>Kamaradere Mahallesi Dağyolu Caddesi No:63, 59740 Marmara Ereğlisi, TEKİRDAĞ / TURKEY</i>
<b>Product/Type:</b> <i>Ürün/Tip:</i>	<b>Humidification and Dehumidification Units</b> <i>Nemlendirme ve Nem Alma Cihazları</i>
<b>Models:</b> <i>Modeller:</i>	<b>See Annex I</b> <i>Bakınız Ek I</i>
<b>Reference Directive(s):</b> <i>Referans Yönetmelik(ler):</i>	<b>Machinery Directive (MD) 2006/42/EC</b> <i>Makine Emniyeti Yönetmeliği (2006/42/AT)</i> <b>Low Voltage Directive (LVD) 2014/35/EU</b> <i>Belirli Gerilim Sınırları Dahilinde Kullanılmak Üzere Tasarlanmış Elektrikli Teçhizat İle İlgili Yönetmelik (2014/35/AB)</i> <b>Electromagnetic Compatibility (EMC) 2014/30/EU</b> <i>Elektromanyetik Uyumluluk Yönetmeliği (EMC) 2014/30/AB</i>
<b>Reference Standard(s):</b> <i>Referans Standart(lar):</i>	<b>EN ISO 12100:2010, EN 13857:2019, IEC 60335-1:2020,</b> <b>EN 60335-2-40:2018, EN 60335-2-98:2003/A11:2019,</b> <b>EN IEC 61000-6-1:2019, IEC 61000-6-3:2020</b>
<b>Base of attestation:</b> <i>Onay Dayanağı:</i>	<b>File of technical documentation, Report No: 21-0056/04</b> <i>Teknik Dökümantasyon, Rapor Nu: 21-0056/04</i>
<b>Issue Date:</b> <i>Yayın Tarihi:</i>	<b>25.02.2021</b>
<b>Expiry Date:</b> <i>Geçerlilik Tarihi:</i>	<b>24.02.2026</b>

**Integra96**, has inspected the documentation presented concerning the product of the company whose name and address mentioned above according to the reference directive and/or reference standards. Suitability of product and documentation to the directive and standards are under the responsibility of the company. However, in case the product is subject to more than directives and standards which are mentioned above, when the company fulfills conditions of other directives and standards, then it can attach CE conformity marking and arrange conformity declaration. This attestation has been issued as per company required. This attestation does not abrogate the compulsory obligation of the manufacturer to issue the declaration of conformity.

**Integra96**, yukarıda bahsi geçen firmanın ürüne ilişkin sunduğu dokümantasyonu yukarıda belirtilen referans yönetmelik ve/veya standartlara göre incelemiştir. Yönetmeliğe ve standartlara göre ürünün ve dokümantasyonun uygunluğu firma sorumluluğundadır. Ürünün diğer ilgili yönetmelik ve standartlara tabi olması durumunda diğer yönetmelik ve standartların şartlarını da firma yerine getirdiğinde yukarıda belirtilen CE uygunluk işareti ürün üzerine iliştilerilebilir ve uygunluk beyanı düzenleyebilir. Bu onay firmanın isteği üzerine verilmiştir. Bu onay üreticinin uygunluk beyanı düzenleme zorunluluğunu ortadan kaldırmaz.



**Ergün CENGİZ**  
**İNTEGRA96 Belgelendirme**  
**İZMİR, (rev. 00) <25.02.2021>**



**Annex I to Certificate No: TRA-21-0056-04**

**Model(s):**

*Modeller:*

<b>Steam Humidifier Unit/ Buharlı Nemlendirme Ünitesi</b>	<b>Portable Evaporative Cooler Unit / Portatif Evaporatif Nemlendirme Ünitesi</b>	<b>Desiccant Rotor Dehumidification Units Desiccant Rotorlu Nem Alma Cihazları</b>	<b>Industrial Dehumidification Unit Endüstriyel Tip Nem Alma Cihazı</b>
TSH-4	PEC-35	TD-D70	TID-120
TSH-8	PEC-40	TD-D160	TID-165
TSH-15	PEC-45	TD-D210	<b>Household Dehumidification Units Ev Tipi Nem Alma Cihazları</b>
TSH-30	PEC-50	TD-D250	THD-06
TSH-42	PEC-60	TD-D320	THD-10
TSH-60	PEC-70	TD-D400	THD-12 S
TSH-84	PEC-80	TD-D450	THD-12 C
TSH-120	PEC-90	TD-D530	THD-16
TSH-133s	PEC-100	TD-D600	THD-20
TSH-144s	<b>Industrial Evaporative Cooler Unit / Endüstriyel Evaporatif Nemlendirme Ünitesi</b>	TD-D700	THD-60
TSH-155s	LPEC-18	TD-D820	<b>Pool Dehumidification Units Havuz Nem Alma Cihazları</b>
TSH-165s	LPEC-22	TD-D1050	TPD-20
<b>Ultrasonic Steam Humidifier Unit / Ultrasonik Nemlendirme Ünitesi</b>	LPEC-30	TD-D1280	TPD-35
TWH-3	LPEC-40	TD-D1550	TPD-45
TWH-6	LPEC-50	TD-D2000	TPD-57
TWH-9	LPEC-60	TD-D2200	TPD-67
TWH-12	LPEC-70	TD-D2500	TPD-85
TWH-3 Premium	LPEC-80	TD-D2800	TPD-100
TWH-6 Premium		TD-D3000	TPD-130
TWH-9 Premium		TD-D3500	TPD-160
TWH-12 Premium	<b>Air Purification Units / Hava Temizleme Cihazları</b>	TD-D4000	<b>Commercial Type Dehumidification Units Ticari Tip Nem Alma Cihazları</b>
TWH-15s	TAP-200	TD-D4500	TCD-50
TWH-18s	TAP-350	TD-D5000	TCD-70
TWH-21s	TAP-488	TD-D6000	TCD-100
TWH-24s	TAP-600	TD-D7000	TCD-120
TWH-4	TAP-800	TD-D8000	<b>Roof-Top Packaged AHU / Roof-Top Paket Klima Cihazları</b>
TWH-8	TAP-1000	TD-D9000	TRT2-10
TWH-16	TAP-200-UV	TD-D11000	TRT5-25
TWH-4 Premium	TAP-350-UV	TD-D12000	TRT10-50
TWH-8 Premium	TAP-488-UV	<b>OEM Steam Humidifier Unit OEM Buharlı Nemlendirme Cihazı</b>	TRT15-75
TWH-16 Premium	TAP-600-UV	TSH4-W	TRT20-100
	TAP-800-UV	TSH8-W	TRT25-150
	TAP-1000-UV	TSH15-W	
		TSH30-W	
		TSH42-W	
		TSH60-W	
		TSH84-W	
		TSH120-W	





# Centrum stavebního inženýrství a.s.

Fire Technical Laboratory

AUTHORIZED  
BODY No. 212

NOTIFIED  
BODY No. 1390

## CLASSIFICATION OF REACTION TO FIRE IN ACCORDANCE WITH ČSN EN 13501-1+A1:2010

**Applicant:** Příhoda s.r.o.  
Za Radnicí 476  
539 01 Hlinsko  
Czech Republic

**Prepared by:** Centrum stavebního inženýrství a.s.  
Pražská 16  
102 00 Praha 10  
Czech Republic

**Product name:** Textile product „Příhoda PMS“ / Textile  
product „Příhoda NMS“

**Classification  
report No.:** PK-14-035

**Issue number:** 1/2

**Date of issue:** 28<sup>th</sup> April 2014

This classification report consists of 4 pages and may only be used or reproduced in its entirety.

Address:  
PRAŽSKÁ 16, 102 00 PRAHA 10, Czech Republic, E mail: [csias@csias.cz](mailto:csias@csias.cz), <http://www.csias.cz>  
Reg. No. 45274860, VAT No. CZ45274860. The Company is registered in the Commercial Register  
administered by the Municipal Court of Prague (section B, inset 1595).  
Fire Technical Laboratory, E-mail: [ptl@csias.cz](mailto:ptl@csias.cz)  
Phone: +420 281 017 111, Fax: +420 281 017 455

## 1. DETAILS OF CLASSIFIED PRODUCT

### Nature and end use application:

The classification of the product *Textile product „Příhoda PMS“ / Textile product „Příhoda NMS“* is valid for the following end use application:

Hanged textile air distribution system

### Description:

The product *Textile product „Příhoda PMS“ / Textile product „Příhoda NMS“* is fully described in the test reports in support of the classification listed in clause 2.

## 2. TEST REPORTS AND TEST RESULTS IN SUPPORT OF THIS CLASSIFICATION

### Test reports

Name of laboratory	Name of sponsor	test report ref. no.	test method
CSI a.s., Fire technical laboratory	Příhoda s.r.o.	17000 - 1/3	ČSN EN ISO 11925-2
		17000 - 2/3	
		17000 - 3/3	ČSN EN 13823

### Measured values a test results

Test method	Parameter	Number of test	Results	
			Continuous parameter mean (m)	Compliance parameters
ČSN EN ISO 11925-2 exposition = 30 s	$F_s \leq 150 \text{ mm}^{(1)}$	6	yes	yes (B to D)
	ignition of filter paper <sup>(1)</sup>	6	no	no (d0)
	$F_s \leq 150 \text{ mm}^{(2)}$	6	yes	yes (B to D)
	ignition of filter paper <sup>(2)</sup>	6	no	no (d0)
ČSN EN 13823 <sup>(7)</sup>	$FIGRA_{0,4 \text{ MJ}} \text{ (W/s)}$	3	0	$\leq 120 \text{ (B)}$
	$LFS < \text{edge}$	3	yes	yes (B)
	$THR_{600 \text{ s}} \text{ (MJ)}$	3	0,5	$\leq 7,5 \text{ (B)}$
	$SMOGRA \text{ (m}^2/\text{s}^2)$	3	0	$\leq 30 \text{ (s1)}$
	$TSP_{600 \text{ s}} \text{ (m}^2)$	3	11,3	$\leq 50 \text{ (s1)}$
	flaming droplets / particles	3	no	no (d0)

(1): surface flame attack

(2): edge flame attack



### 3. CLASSIFICATION AND DIRECT FIELD OF APPLICATION

---

#### Reference and direct field of application

This classification has been carried out in accordance with the clauses 11.6, 11.9.2 and 11.10.1 of ČSN EN 13501-1+A1:2010.

#### Classification

The product *Textile product „Příhoda PMS“ / Textile product „Příhoda NMS“*, in relation to its reaction to fire behaviour is classified:

**B**

The additional classification in relation to smoke production is:

**s1**

The additional classification in relation to flaming droplets/particles is:

**d0**

The format of the reaction to fire classification for *Textile product „Příhoda PMS“ / Textile product „Příhoda NMS“* is:

Fire behaviour		Smoke production			Flaming droplets	
B	-	s	1	,	d	0

**Reaction to fire classification: B-s1, d0**

#### Field of application

This classification is valid for the following end use conditions:

- Without substrate

#### 4. LIMITATIONS

---

##### Restrictions

This classification report is valid until 28<sup>th</sup> April 2019, provided that the technical specifications of the product will not be changed.

##### Warning

This document does not represent type approval or certification of the product.

Prepared:



.....  
Jiří Socha



Reviewed:



.....  
Vít Slaboch  
head of laboratory





**Výzkumný ústav pozemních staveb - Certifikační společnost, s.r.o.**

Autorizovaná osoba 227 Notifikovaná osoba 1516 Certifikační orgán pro výroby, kvalifikaci a EPD Zkušební laboratoř

**Certifikační orgán pro systémy managementu č. 3009 akreditovaný ČIA**

# CERTIFICATE



**PŘÍHODA s.r.o.**

The company has introduced and holds the Quality management system complying with the requirements of

**ČSN EN ISO 9001:2009**

Holder  
Address: Hlinsko v Čechách, Za radnicí 476, PSČ 539 01; IČ: 62024205

Certificate  
Number: 3009/441-10/SMJ

Certificate  
Scope: Manufacturing of textile air distribution systems

Localities  
Specification: The seat of the company.

This Certificate is valid until 6.10.2013. The validity of the Certificate is determined by fulfilment of conditions specified in the Final Protocol on the certification process No. P-3009/441-10/SMJ of the 7.10.2010.

In Prague 7.10.2010



*Lada Pluhařová*

**Ing. Lada Pluhařová**  
Head of the Certification Body for QMS





---

## NATIONAL HEALTH INSTITUTE

Šrobárova 48  
Praha 10  
100 42

---

Příhoda s.r.o.  
  
Za radnicí 476  
  
53901 Hlinsko

YOUR LETTER REF.: Order  
YOUR LETTER OF: 17 March 2005  
OUR REF.: 537/05, E-012015,  
ZŽP 19-372/05, Ex 5207519  
RESPONSIBLE PERSON: RNDf. K. Klánová, CSc.  
TEL./FAX 267082345  
[E.MAIL:klank@szu.cz](mailto:klank@szu.cz)  
DATE: 13 April 2005

### **SUBJECT**

Assessment of applicability of use of textile air distribution ducts for the distribution of air particularly in food industry

### **SUBJECT OF APPLICATION**

You have provided us with five products (see below) enclosed with your application for assessment of applicability of textile air ducts to distribution of air in food industry considered from the microbiologic-hygienic standpoint. The fabrics are of the same chemical basis (100% PES), they differ in the colour and permeability only. The catalogue number was not stated. The producer of the textile air diffusers and the address: Příhoda s.r.o., Za Radnici 476. Application: The textile air diffusers are designed for providing ventilation, cooling and heating of industrial buildings, in food industry especially.

### **PROVIDED SAMPLES**

Sample No.1: NHI fabric, white, sample size 1 m<sup>2</sup>, 100% PES  
Sample No.2: PLS fabric, white, sample size 1 m<sup>2</sup>, 100% PES  
Sample No.3: PMS fabric, white, sample size 1 m<sup>2</sup>, 100% PES  
Sample No.4: PMI fabric, white, sample size 1 m<sup>2</sup>, 100% PES  
Sample No.5: PLI fabric, white, sample size 1 m<sup>2</sup>, 100% PES

### **PROVIDED DOCUMENTATION**

We learned further information concerning the application of the textile air diffusers from [www.prihoda.cz](http://www.prihoda.cz) - the application of the textile air diffusers. We learned of the possibility of distribution of air by means of your system, including maintenance (washing) instructions.

### **INTRODUCTION**

Air handling equipment, in particular ducts distributing air, can be the source of microbial contamination, and therefore it is essential to pay attention to the cleanliness of such equipment. The most common reason for survival and reproduction of microorganisms in those ducts is the condensation of water vapors and consequent presence of water in which the microorganisms, in microscopic impurities, find nutrition. Water is the fundamental prerequisite of life and reproduction.

Not only microorganisms, but also their biologically active matters, such as toxins or volatile organic matters can enter the ambient air from the polluted air distribution ducts. When these microorganisms, it means bacteria, fungi or biologically active matters, are inhaled from the ambient air, the health of people can be jeopardized.

The microorganisms from the air jeopardize not only the health of people, but can also cause problems for instance in food industry, where they are particularly involved in decomposing processes, which is spoilage of basic material, half-finished product or products. Foodstuff and food basic material that contain enough water can also become a nutrient medium for propagation of pathogenic microorganisms, if such microorganisms get from the foodstuff to the ambient air.

Due to the above mentioned reasons the ambient air in food processing industries must contain the least possible amount of microorganisms. Therefore the air condition system, which is to conduct microbiologically clean air to the food plant or operation, is an important mechanical device.

From the practical point of view it is, however, very difficult to maintain the air distribution ducts clean, mainly due to their difficult cleaning. The ducts are too long, and have many parts which are very difficult to be accessed (ducts' bends), etc.

The assessed textile air distribution ducts have two important advantages in contrast to classical ducts. They are divided into smaller parts that are connected through classical zips; it means there are no parts that would be difficult to access.

The second important advantage of those systems is the possibility to wash them, which is the easiest method of cleaning. With regards to these facts, in clear majority of cases there is no need to use disinfectants.

Using microbiological testing we have tried to determine if the presented textiles specified as NHI, LS and PMS that are used for the distribution of air are not an optimum substrate for survival of microorganisms, and if those do not represent hygienic risk.

Considering that there is no available binding methodology for such testing, we have used the method of our laboratory.

In the experiments we have simulated a situation of high concentration of microorganisms that were put on the textile samples; and at certain time intervals we have documented the presence of microorganisms on the samples.

As a check for the above mentioned samples of textiles we have used aluminum foil that simulated a sample of metal piping.

## **MATERIAL AND METHODS**

For the purpose of testing we have selected the following microorganisms that are most commonly traced in the foodstuff (Decree No. 132/2004): representative of coagulase-positive staphylococcus *Staphylococcus aureus*, one of coliform bacteria *Escherichia coli*, further bacteria *Pseudomonas aeruginosa* and concerning yeasts and fungi we have tested *Candida albicans* and *Aspergillus niger*.

The tested materials were adjusted to samples with dimensions of 5 x 5 cm. We have inoculated 0.1 ml of suspension of microorganisms in concentration of  $10^8$ /ml. Textile samples along with aluminum foil and microorganisms were put in clean Petri dishes that were closed and placed into a thermostat without temperature regulation (18-24 °C). High humidity of the air in the thermostat was achieved by inserting an open bin with sterile water. Each material has been inoculated five times for each microorganism.



At certain time intervals the dishes with the samples were removed from the thermostat and the samples were put on respective agar media. After the incubation which was in line with common laboratory practice (it means the structure of cultivation media, incubation temperatures and incubation time), we have used the following assessment to find out the increase of microorganisms:

- - not done
- **nd** not found (no increase)
- **+** weak increase
- **++** average increase
- **+++** heavy increase

The results of the experiments are tabulated hereunder.

### EXPERIMENT 1

Tested material		Microorganisms														
		Staphylococcus aureus			Escherichia coli			Pseudomonas aeruginosa			Candida albicans			Aspergillus niger		
<b>NHI</b>	days	3	9	20	3	9	20	3	9	20	3	9	20	3	9	20
	increase	nd	-	-	++	+	nd	++	+	nd	-	+	+	-	++	+++
<b>PLS</b>	days	3	9	20	3	9	20	3	9	20	3	9	20	3	9	20
	increase	nd	-	-	+	+	nd	++	+	nd	-	++	++	-	++	+++
<b>PMS</b>	days	3	9	20	3	9	20	3	9	20	3	9	20	3	9	20
	increase	nd	-	-	++	+	nd	++	+	nd	-	++	+	-	++	+++
<b>Aluminum folio</b>	days	3	9	20	3	9	20	3	9	20	3	9	20	3	9	20
	increase	nd	-	-	++	+	nd	++	++	nd	-	++	+++	-	++	+++

### EXPERIMENT 2

Tested material		Microorganisms														
		Staphylococcus aureus			Escherichia coli			Pseudomonas aeruginosa			Candida albicans			Aspergillus niger		
<b>PLI</b>	days	0	2	7	0	2	7	0	2	7	0	7	17	0	7	17
	increase	+	+	Nd	+	nd	-	+	nd	-	+	+	+	+	+	+
<b>PMI</b>	days	0	2	7	0	2	7	0	2	7	0	7	17	0	7	17
	increase	+	+	Nd	+	nd	-	+	nd	-	+	+	+	+	+	+
<b>Aluminum folio</b>	days	0	2	7	0	2	7	0	2	7	0	7	17	0	7	17
	increase	+	+	Nd	+	nd	-	+	nd	-	+	+	+	+	+	+

## EXPERT OPINION

With given experiment 1 conditions we have proved that even a minimum quantity of water can enable the microorganisms to survive. In our test it was 0.1 ml of water that we have added to the material and microorganisms. Under these conditions and at the laboratory temperature the bacteria *Escherichia coli* and *Pseudomonas aeruginosa* survived more than 9 days on all tested materials. The yeasts *Candida albicans* and fungi *Aspergillus niger* remained viable thorough the entire time of experiment and on all tested materials.

Aluminum folio was slightly better concerning the survival of *Escherichia coli* and *Pseudomonas aeruginosa* bacteria, and aluminum folio, in contrast to textiles, was considerably better for the survival of *Candida albicans* yeasts. This situation is probably connected with the ability of the mentioned materials to retain water that is the highest with aluminum folio (it has simulated sheet-metal or stainless steel piping).

With given experiment 2 conditions we have proved that neither the bacteria *Escherichia coli* nor *Pseudomonas Aeruginosa* managed to survive more than 2 days on all the tested materials, the bacteria *Staphylococcus aureus* did not remain viable more than 7 days.

*Candida albicans* yeasts and fungi *Aspergillus niger* remained viable through the entire time of experiment, i.e. 17 days.

From the microbiological-hygienic point of view we consider textile air ducts used for the distribution of air suitable and applicable; and the application does not need to include only food industry.

No material differences have been found among the tested materials. Aluminum folio was slightly better concerning the survival of *Escherichia coli* and *Pseudomonas aeruginosa* bacteria, and aluminum folio, in contrast to textiles, was considerably better for the survival of *Candida albicans* yeasts. Aluminum folio was slightly better concerning the survival of the fungi *Aspergillus niger* under the experiment 2 conditions.

This situation is probably connected with the ability of the mentioned materials to retain water that is the highest with aluminum folio (it has simulated sheet-metal or stainless steel piping).

The comparison of various materials regarding potential survival of microorganisms can be done only under the laboratory conditions where the conditions for all materials are identical. The testing was carried out under extreme conditions that cannot be found in normal standard environment, i.e. under the conditions of massive inoculation with microorganisms and with sufficient amount of fluid matter. Therefore in no case the results can be interpreted such that bacteria and fungi will grow on the tested materials under normal usage of the material.

## CONCLUSION

From the microbiological-hygienic point of view we consider textile air ducts used for the distribution of air suitable and applicable in food industry if the required maintenance instructions are observed. This expert opinion concerns the provided samples only, the drawn conclusions can be applied to the same products only if they are made of the same material and in the same technological and hygienic conditions.

Doc. MUDr. L.Komárek, CSc  
The Head of the Centre of Health and Living Conditions

*razítko*  
NATIONAL HEALTH INSTITUTE  
The Centre of Health and Living Conditions  
Šrobárova 48  
100 42 Praha 10

---

TELEPHONE NUMBER OF SWITCHBOARD: 267 081 11]

BANK CONNECTION: 1730101/0710 IC: 75010330

FAX 272 744 354

IČ: 75010330

ÖTI - INSTITUT FÜR ÖKOLOGIE, TECHNIK UND  
INNOVATION GMBH  
SPENGERGASSE 20  
1050 WIEN, AUSTRIA

**OEKO-TEX®**  
CONFIDENCE IN TEXTILES

# CERTIFICATE

## The company

**PRIHODA s.r.o.**  
Za Radnici 476  
53901 Hlinsko v Cechach, CZECH REPUBLIC

is granted authorisation according to STANDARD 100 by OEKO-TEX® to use the OEKO-TEX® mark, based on our test report **PG025 124101.2**



## for the following articles

**Tailor-made ducting and diffusers for the transport or distribution of air made from polyester fabrics, single suspended, partly made from materials certified according to Standard 100 by OEKO-TEX®**

The results of the inspection made according to STANDARD 100 by OEKO-TEX®, **product class II** have shown that the above mentioned goods meet the human-ecological requirements of the standard presently established for products with direct contact to skin.

The certified articles fulfil the requirements of Annex XVII of REACH (incl. the use of azo-dyes, nickel, etc.) as well as the American requirement regarding total content of lead in children's articles (CPSIA; with the exception of accessories made from glass).

The holder of the certificate, who has issued a conformity declaration according to ISO 17050-1, is under an obligation to use the OEKO-TEX® mark only in conjunction with products that conform with the sample initially tested. The conformity is verified by audits.

**The certificate PG025 124101 is valid until 30.11.2017**

Wien, 29.11.2016

*Helene Melnitzky*  
\_\_\_\_\_  
OEKO-TEX® Department Dipl.-HTL-Ing. Helene Melnitzky





# CERTIFICATE OF COMPLIANCE

**Certificate Number** 20140522-R25183  
**Report Reference** R25183-20140516  
**Issue Date** 2014-MAY-22

**Issued to:** PRIHODA S R O  
Za Radnici 476, 53901 Hlinsko CZECH REPUBLIC


**This is to certify that representative samples of** DISTRIBUTION DEVICES, AIR  
Air distribution device fabric identified as "PMS fabric".

Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.

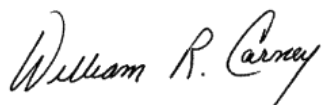
**Standard(s) for Safety:** UL723, the Standard for Surface Burning Characteristics for Building Materials

**Additional Information:** See the UL Online Certifications Directory at [www.ul.com/database](http://www.ul.com/database) for additional information

Only those products bearing the UL Classification Mark should be considered as being covered by UL's Classification and Follow-Up Service.

The UL Classification Mark includes: UL in a circle: with the word "CLASSIFIED"  (as shown); a control number (may be alphanumeric) assigned by UL; a statement to indicate the extent of UL's evaluation of the product; and the product category name (product identity) as indicated in the appropriate UL Directory.

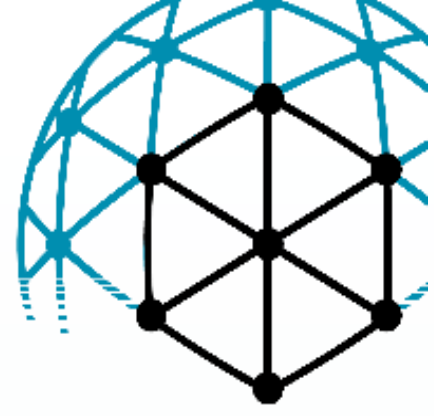
Look for the UL Classification Mark on the product.



William R. Carney, Director, North American Certification Programs

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at [www.ul.com/contactus](http://www.ul.com/contactus)



# ELECTRICAL WORKS

# TROPICAL ROOFTOP

## STANDARD



## OPTIONAL

- Condenser fan speed control
- Hydrophilic/epoxy coating on evaporator and condenser coil surface
- Protection mesh for condenser surface
- Electronic expansion valve
- Dirty filter alarm
- Stainless drain pan
- High or low capacity electric heater
- Smoke sensor
- External fire alarm
- Low pressure transmitter
- High pressure transmitter
- IP55 power and control board
- Safety valve
- Shut off valve
- Metal or bag filters
- Adjustable belt pulley
- Main load breaker
- Modbus Rtu communication card

Imbat tropical rooftops have been designed for T3 climate areas. They provide extremely high performance when they are used in colder climates.

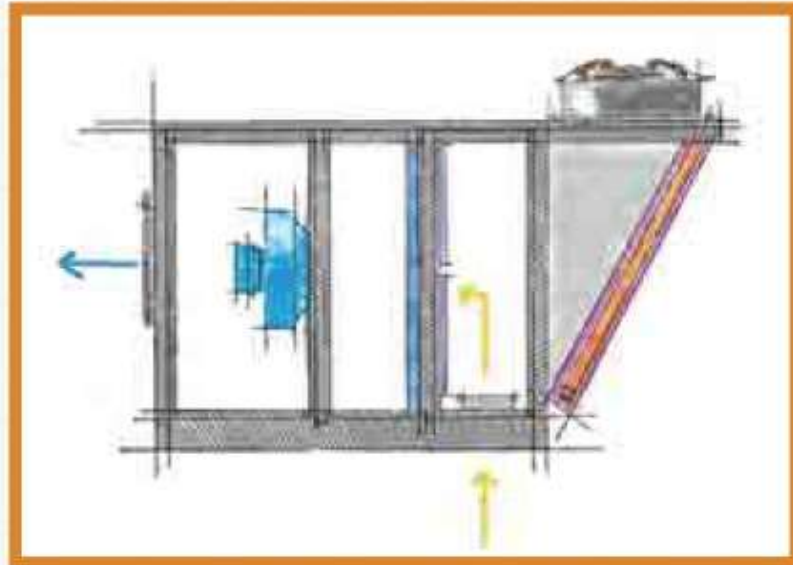
Imbat tropical rooftops have an environmentally friendly, high Energy efficiency design. They use scroll compressors, electric heater, G4 filter, noise and heat insulation, high efficiency radial internal circulation fan, axial condenser fan, microchannel condenser, minimum amount of refrigerant and an advanced processor card.

Imbat tropical rooftops have 17 different capacities in 15-260 kW range.

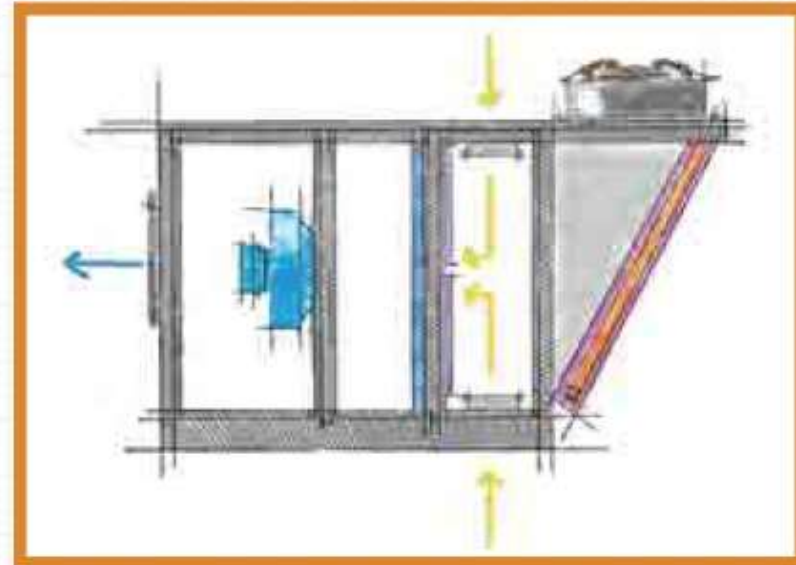




Supply fan 100% return air



Supply fan partial fresh air



- High energy efficiency
- Electric heater
- Monoblock compact design
- Temperature and noise insulated
- High efficiency fans, E2 motors
- Advanced control options
- IP 54 power and control panel

## MAIN SPECIFICATIONS

MODEL RT.HTG...		0051/1.S	0061/1.S	0091/1.S	0121/1.S	0151/1.S	0182/1.S	0192/1.S	0242/1.S	0302/1.S	0332/1.S	0453/1.S	0504/2.S	0552/1.S	0625/2.S	0695/2.S	0802/1.S	0906/2.S	
<b>Cooling</b>																			
Cooling capacity (1)	kW	15,51	19,21	27,83	34,64	42,19	53,02	60,10	70,44	88,75	98,15	128,39	153,71	166,87	180,51	200,15	234,41	261,42	
Compressor power intake (1)	kW	4,04	4,29	6,55	9,10	12,35	14,08	14,09	18,29	24,10	28,13	37,08	37,00	42,34	47,55	54,93	61,80	72,54	
EER (1)		2,85	2,76	2,92	2,62	2,68	3,02	3,02	2,92	2,73	2,69	2,66	3,00	2,78	2,90	2,75	2,76	2,63	
Cooling capacity (2)	kW	13,8	17,57	24,46	31,02	36,16	47,65	53,47	62,16	78,23	85,28	113,48	137,43	149,30	162,67	180,25	210,00	234,52	
Compressor power intake (2)	kW	4,99	5,38	8,28	11,23	15,12	17,51	17,82	22,28	29,38	34,61	45,87	45,82	52,13	58,53	67,82	75,96	89,70	
EER (2)		2,17	2,19	2,17	2,02	1,95	2,27	2,27	2,22	2,07	2,01	2,03	2,29	2,14	2,22	2,11	2,12	2,01	
<b>Compressor</b>																			
Refrigerant		R-410a																	
Compressor quantity	pcs	1	1	1	1	1	2	2	2	2	2	3	4	2	5	5	2	6	
Compressor type		Scroll																	
Cooling circuit	pcs	1	1	1	1	1	1	1	1	1	1	1	2	1	2	2	1	2	
<b>Supply Fan (Ventilator)</b>																			
Fan type		Radial																	
Airflow	m <sup>3</sup> /h	2800	4000	5100	6700	7530	9000	11500	13000	15000	17500	21500	25000	26000	28000	30500	38000	41550	
Static pressure	Pa	50	50	62	75	75	100	100	100	125	125	150	175	175	175	175	175	175	
Fan quantity	pcs	1	1	1	1	1	1	2	2	2	2	1	1	1	2	2	2	2	
Fan motor power	kW	0,75	0,75	1,1	2,2	1,5	2,2	3	3	4,4	4,4	7,5	7,5	11	8	11	11	15	
<b>Heating-Electric Resistance</b>																			
Capacity (ΔT=15°C)	kW	14	20	25	33	37	44	57	64	74	86	106	123	128	138	150	187	204	
<b>Condenser</b>																			
Fan type		Axial																	
Fan quantity	pcs	1	1	1	1	1	2	4	4	2	2	2	4	4	4	4	6	6	
Airflow	m <sup>3</sup> /h	8200	17800	17800	17800	17800	16800	27200	27200	31000	31000	36000	80000	80000	80000	80000	96800	96800	
Fan motor power	kW	0,65	1,91	1,87	1,91	1,87	1,27	2,83	2,83	4,02	4,02	3,76	6,72	6,72	6,72	6,72	12,00	12,00	
<b>Noise Pressure Level</b>																			
Noise pressure level (1 m)	dB(A)	74,1	75,7	78,1	77,8	76,8	77,3	79,1	80,0	80,9	81,0	81,8	83,6	85,9	84,8	82,8	89,5	86,1	
Noise pressure level (10 m)	dB(A)	55,8	57,4	59,8	59,5	58,5	59,0	60,8	61,7	62,6	62,7	63,5	65,3	67,6	66,5	64,6	71,2	67,8	

(1) According to EN 12511 standards, ambient temperature 35°C, indoor temperature 27/19°C.

(2) Ambient temperature 46°C, indoor temperature 27/19°C.

## WHAT MAKES **IMBAT** DIFFERENT

### HIGH AMBIENT TEMPERATURE

The units are designed for T3 climate areas for +46°C ambient temperature and can operate up to +52°C.

### HIGH EFFICIENCY

The units provide quality indoor air and high efficiency via the advanced microprocessor.

### COMPACT BODY, PLUG & PLAY

Imbat tropical rooftops are plug & play. Units have microchannel condensers and are designed to set-up quickly and are very easy to service and do maintenance.

# ELECTRICITY

The list of material brands to be used in lighting, weak current, and electrical manufacturing to be determined and projected within the scope of the electrical project is presented below for your information. The brand list will be determined according to the project.

- High Current Cable: Prysmian, Nexans, Hess
- Weak Current Cable: Erse, 2M, HCS
- Electrical Panel: EAE, Siemens, Schneider
- Electrical Panel Materials: Siemens, Schneider, ABB
- Bus-Bar : EAE, Gersan
- Cable Tray and Cable Ladder System: EAE, German
- Plug and Socket: Bticino, Legrand
- Electrical Pipe System: Canlar, Elsu, Ensmet
- Earthing System: Amper ,Radsan, Obo Betterman
- Lighting Fixture: Philips, Zumtobel Group, Gewiss