

## SKV, TPV

### Ventilation and extraction ceilings for industrial kitchens

- Low cost
- Closed extraction system
- In-built UVC filtration
- Eliminate mold formation
- Automatic operation control
- Attractive design
- Easy maintenance
- Easy cleaning
- LED lighting



**SKV, TPV,  
TPV Exclusive**



#### TPV Exclusive

Using LED lighting to achieve excellent design of so called show kitchen

#### Separators TPV

Grease separators in the extraction air duct located variably to match the layout of appliances



#### SKV

The perfect design and function enable to connect the kitchen with the restaurant area

#### TPV

A large scale design textile diffuser



#### UV-C filtration

In-built UV-C filtration with a fat elimination efficiency of up to 99 %



**Atrea®**

KITCHEN VENTILATION

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# DESCRIPTION

## APPLICATION

Ventilation and extraction ceilings are intended for industrial cooking facilities. They are especially suitable for kitchens with appliances located separately across the entire area, which would make the installation of individual extractor hoods costly and complicated, with unesthetic supply and exhaust ductwork. They are also suitable for spaces with low or vaulted ceilings where extractor hoods cannot be fitted at all.

Ceilings can also be used in other facilities with high requirements for design and uniform extraction and lighting, such as open kitchens and catering counters etc.

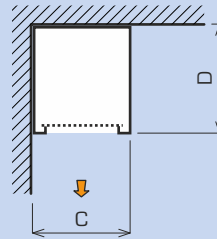
## GENERAL DESCRIPTION OF THE SYSTEM

### Closed ventilation systems

The closed system of ventilation and air-conditioning ceilings is made up of a network of extraction, collection and supply ducts. As standard they include transparent false ceilings with fluorescent tubes fitted on top of them. The construction of ventilation and air-conditioning ceilings meets VDI 2052 (Germany) regulations in effect on kitchen ventilation.

### Supply air ducts

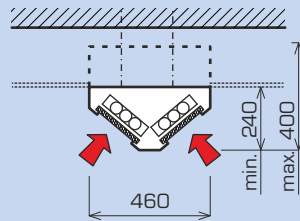
False ceiling components are made of steel. The bottom surface is a large-area microperforated fabric diffuser. The central version uses perforated stainless metal.



### Extraction ducts

#### TPV

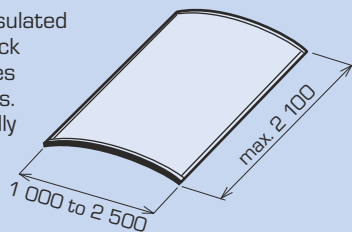
As standard, ducts have a triangular profile. False ceiling parts are made of stainless sheet metal 1 mm thick. Optionally with UVC filtration.



### Transparent false ceilings

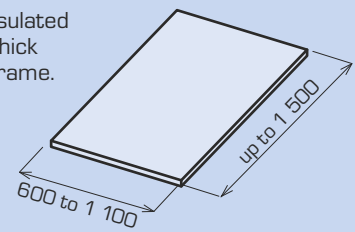
#### SKV - arched

False ceilings are made up of insulated polycarbonate boards 6 mm thick mounted in steel concave frames and covered with stainless strips. The frames are fixed hermetically using locks via rubber seals to the extraction duct side.



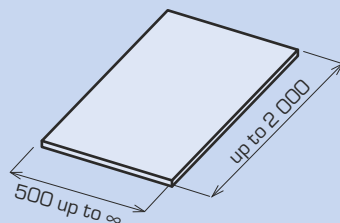
#### TPV - flat

False ceilings are made up of insulated polycarbonate boards 10 mm thick mounted in a sealed stainless frame. Individual modules are laid on a stainless grid and the side of the extraction duct.



#### TPV Exclusive - tensioned foil

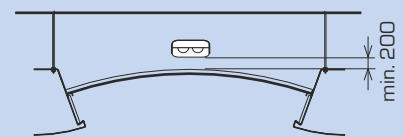
False ceiling is made of uniform translucent foil to achieve design light effect.



### Lights

Lights are standard components of the closed system of ventilation and air-conditioning ceilings. ATREA draws up a light installation layout and the customer then adds requirements for controls (the position and type of switches, cabling routes, zoning) and the lights are installed as part of the ceiling project according to CSN 360450 for Class B and C work.

The calculation of lighting power is based on the minimum level of illumination of 500 lx on the work top in keeping with health requirements for kitchen work areas. The light transmission coefficient of the transparent fillers is assumed as  $t = 0.9$ . As standard cover-free fluorescent tubes with a reflector or cover-free special LED lights are used.



### Installation

SKV and TPV ceilings (i.e. extraction and supply ducts) are suspended from ceiling structures using threaded zinc-coated suspension rods MB or M10.

The rods are fixed into the ceiling with anchors (expansion anchors, wall plugs), each with a loading capacity of at least  $P = 1.0$  kN

## GENERAL DESCRIPTION OF THE SYSTEM

### Mechanical filtration – Cassette filters

Cassette grease filters are fitted on the side of extraction ducts. They are made of layered expanded metal in a 500 x 175 mm stainless sheet metal frame. If supplied with UV-C filtration, the grease filter additionally contains stainless lamellas to increase the efficiency of filtration and separate the UV-C filtration function from occupancy areas. The space between filters has stainless sheet metal plugs. **The number** of grease filters is calculated based on the extraction air volume so that flow rates through one filter are within optimum  $w_{opt}$  according to the graph (i.e.  $V_{opt} = 200 - 250 \text{ m}^3/\text{h}$ ).

**The layout** of grease filters in the kitchen should match the layout of kitchen equipment. The advantage is that the filters can be repositioned across the entire length of extraction ducts if the layout of kitchen equipment is altered.

**UV-C filtration technology** – Exhaust air extraction without odour and grease generated during cooking. The system is designed based on the determined extraction capacity, the type of equipment and the efficiency of mechanical filtration which is not to fall below 75 %. If all conditions during the system design stage are met, the efficiency of residual grease elimination is up to 99 %.

### How UV-C technology works

- As exhaust air runs through mechanical filtration (grease filters 500 x 175 mm) 80 % of grease particles are eliminated
- Exhaust air runs through UV-C lamps
- UV-C lamps create ozone in surrounding air
- As ozone reacts with organic compounds (greases), these oxidize or are destroyed in a cold burning process
- All that is left in exhaust air after oxidation is water vapour,  $\text{CO}_2$  and traces of fine powder (so-called polymerized wax)

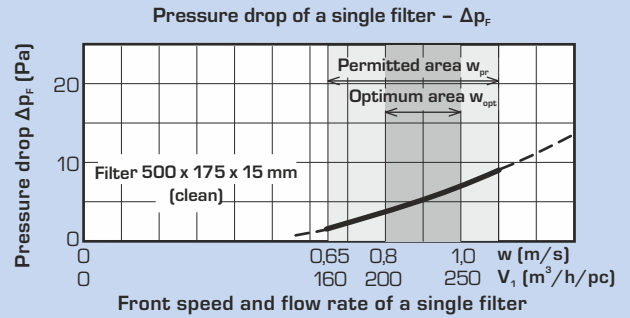
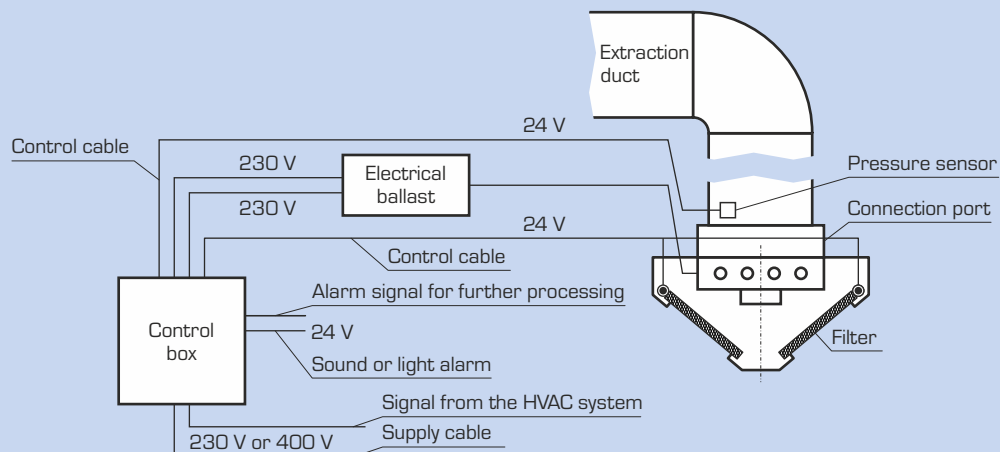
### Why use UV-C technology

- The entire system is maintained perfectly clean and does not age
- Odourless exhaust air
- Significantly lower cleaning and maintenance costs
- A minimum risk of fire
- The most stringent criteria and requirements for clean environments are met

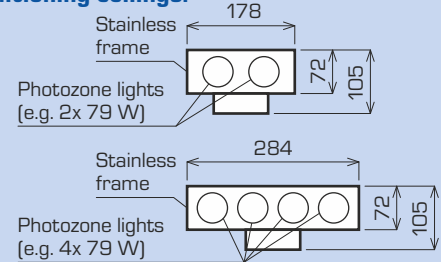
### Planning documents

- The facility's ground plan with the layout of kitchen equipment
- Kitchen equipment parameters
- The parameters of the ventilation and air-conditioning ceiling (designed by ATREA)

### Sample UV-C filtration diagram

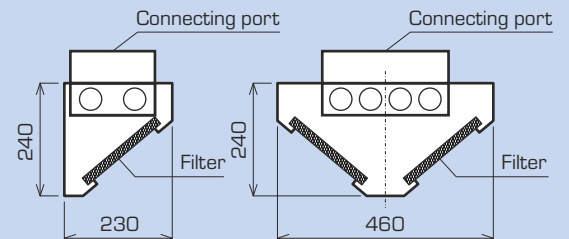


### UV-C light types for SKV and TPV ventilation and air-conditioning ceilings:

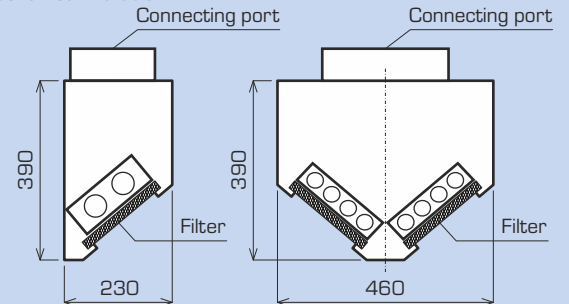


### An example of fitting UV-C lights into TPV ceiling extraction ducts:

Option 1: Installation directly below the drain pipe connecting port



Option 2: Installation uniformly downstream mechanical filtration



# AVAILABLE TYPES

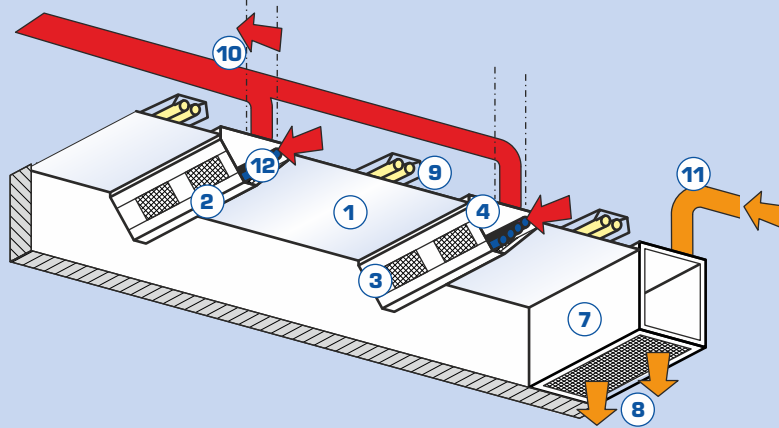
## AVAILABLE VENTILATION CEILING TYPES - GENERAL DESCRIPTION

SKV and TPV ventilation and air-conditioning ceilings are versatile modular systems with high layout and constructional flexibility.

There are three types – A, B and C – that differ in the way they are connected to collection and supply ducts.

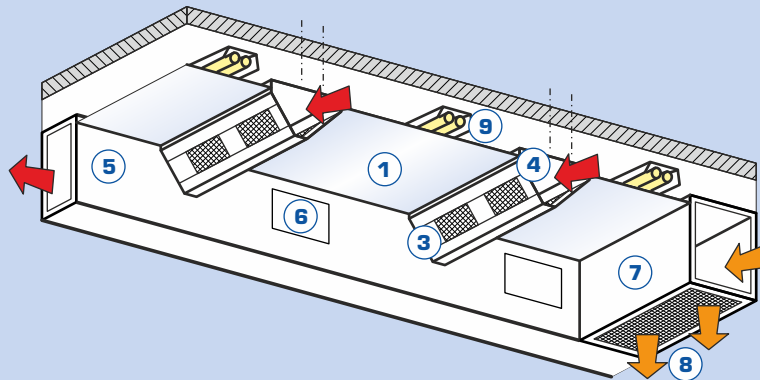
### Type A: Integrated system with transparent false ceilings and UV-C filtration

This system is designed for all kitchens demanding the maximum level of exhaust air filtration efficiency; as standard it is fitted with UV-C filtration.



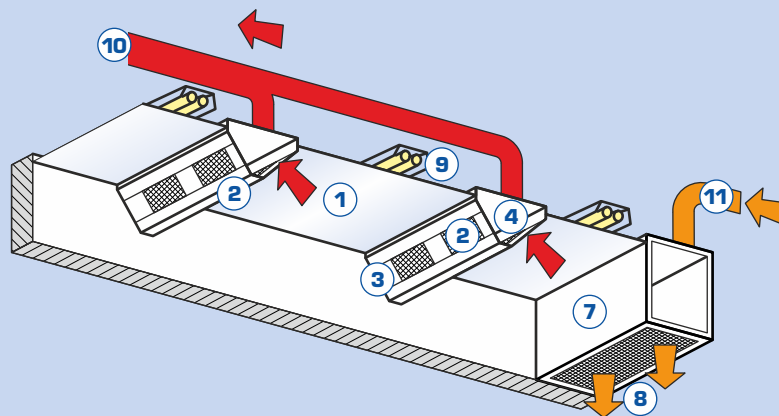
### Type B: Integrated systems with transparent false ceilings

Extraction, collection and supply ducts are installed horizontally. These systems are used in low spaces.



### Type C: Systems with overhead ductwork

Extraction and supply ducts are connected to collection ducts vertically from the top. These systems are used in higher spaces; they are suitable for large-area kitchens and when existing spaces require lowering.



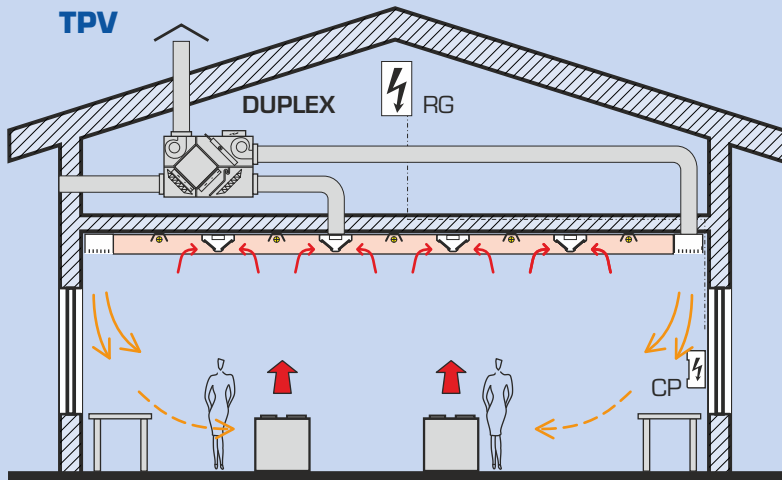
#### Legend

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. Transparent false ceiling        | 8. Large cross-section outlets       |
| 2. Grease filters                   | 9. Fluorescent lights                |
| 3. Interjacent inserts              | 10. *Overhead extraction ducts       |
| 4. Extraction duct                  | 11. *Overhead supply ducts           |
| 5. Collection duct                  | 12. *UV-C filtration                 |
| 6. Cleaning and inspection openings | *] not supplied with TPV as standard |
| 7. Supply duct                      |                                      |

## SYSTEMS

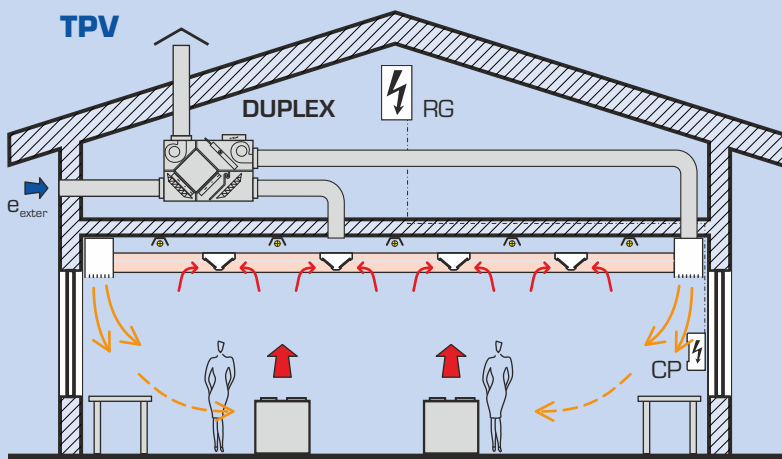
### Type A

- A ventilation and air-conditioning ceiling with UV-C filtration
- This ceiling has transparent false ceilings and integrated vertical (from the top) or horizontal air supply
- An integrated system suitable for kitchens with a minimum height of **2.6 m**
- Air ducts as well as fluorescent lighting fixtures are suspended on rods from the ceiling structure



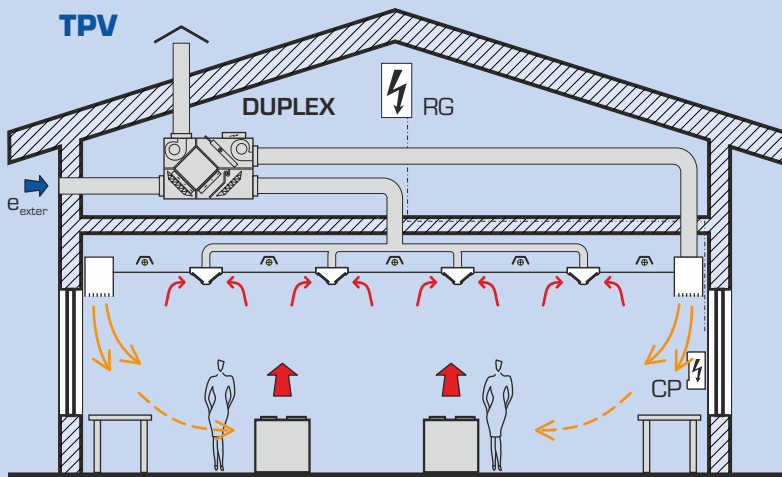
### Type B

- A ceiling with transparent false ceilings and integrated horizontal collection and supply air ducts
- This integrated system with transparent false ceilings and horizontal air ducts is generally designed for low to medium-height spaces from **2.6 m** up
- Extraction ducts are suspended from the ceiling structure while fluorescent lighting fixtures are installed on the ceiling



### Type C

- A ceiling with transparent false ceilings with integrated circumferential air supply and extraction from the top
- This system with an overhead extraction duct and circumferential supply is used for medium-size spaces and heights from **3.2 m**
- Extraction ducts as well as fluorescent lighting fixtures are suspended on rods from the ceiling structure



# CONTROL, MAINTENANCE

## AUTOMATIC OPERATION CONTROL

### Basic overview

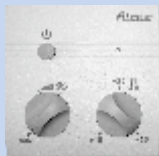
Automatic kitchen ventilation control system is an optional accessory for ATREA's kitchen extractor hoods and extraction ceilings in industrial kitchens.

The microprocessor control system ensures economical operation which depends on the immediate rate of heat generation by kitchen equipment, thus preventing the costly operation of fans at times when no cooking is taking place or the heat load is reduced.

The basic principle of automatic controls is temperature sensing in the space above appliances and in the kitchen. If these temperatures do not differ, fans are running at a minimum speed to provide the essential air change rate in the kitchen and gas appliances are allowed to run. When the temperature difference between the temperature sensors exceeds the set value, both the exhaust and supply fans automatically switch to a higher power level. If the temperature difference increases any further, both fans switch to the maximum power level. When the difference becomes lower, the power level is automatically reduced or changes to the basic minimum air change rate.

### Advantages of automatic controls

- Energy-saving operation
- Ensures perfect hygienic conditions in kitchens
- External signal from convection ovens for maximum performance
- Continuous ventilation power control (0–10 V)
- Optional fully automatic ventilation power control depending on immediate loads from the kitchen
- Temperature- and humidity-based control
- Zone ventilation of facilities and cooking sections
- Remote access
- A weekly programming option
- Holiday mode (for use for instance on bank holiday days)
- An option to set several operation segments for a single day
- Heating and non-heating season control



### Economical operation with automatic control

A well-designed automatic control system primarily aims at eliminating the human factor to reduce the energy intensity of fan operation and ventilation air re-heating.

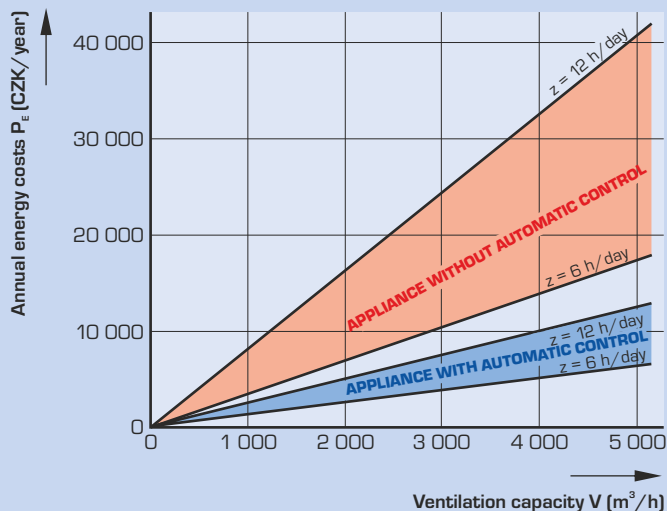
The graph compares annual costs to run fans in relation to ventilation capacity and daily operation (for CZK 3.50 / kWh of power). The graph does not include energy savings on air re-heating!!

### The calculation is provided for the following parameters:

HVAC system parameters:  $D_p = 550$  Pa, fan efficiency 0.55, 300 days / year in use, the automatic control system reduces performance in 70 % of operation time to 45 %  $N_{max}$

### Conclusion

The return on investment in an ATREA-type automatic control system generally tends to be within 1 year.



## MAINTENANCE AND CLEANING

### Maintenance

Maintenance primarily means the regular cleaning of grease filters. Cassette grease filters can be removed and cleaned very easily using a dishwasher or in a sink in water with detergent. Cleaning is recommended every 10–20 days depending on the type of kitchen facility and contamination.

### Cleaning

All stainless sheet metal surfaces are cleaned using special cleaning and preservation agents such as Cilit Bang every 1–3 month depending on the type of kitchen facility.

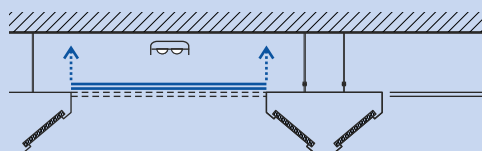
Collecting air ducts are fitted with cleaning openings with air-tight covers to allow checking the level of contamination and conducting maintenance.

Transparent polycarbonate false ceiling hardly get contaminated at all due to their completely smooth surface. At the same time the "no-drop" finish prevents the formation and dripping of condensate drops.

### Replacing fluorescent lighting fixtures

Fluorescent lights are accessible after unfastening the air-tight transparent false ceiling by loosening the screws and moving it forward to the adjacent field.

### TPV



The way of fastening Makrolon false ceiling using eccentric click-on clips.

## DESIGN, SIZING AND ORDER SPECIFICATION

### 1) Concept design

A ceiling type and the position of extraction ducts in a M = 1,800–2,400 mm module using ATREA s.r.o.'s design is selected based on the specified space and the layout of kitchen equipment, the height and the way of connecting to a HVAC system. The cross-sections of collection and supply ducts and the number of grease filters are then determined for the ventilation capacity calculated. If kitchen appliances with the extraction of waste gases ("B") are used, flue passages through the ceiling must be indicated on the drawing.

### 2) Sizing

The air capacity of the extraction ceiling is sized according to VDI 2052 guidelines; the extraction air volume is calculated by ATREA's free application "Kitchen ventilation" (available on [www.atrea.eu](http://www.atrea.eu) or on a CD).

For sizing an SKV system we recommend maintaining the airflow speeds and volumes:

- Grease filters	:	w = 0,8 – 1,0 m/s	$V_1 = 200-250 \text{ m}^3/\text{h}/\text{pc}$
- Extraction ducts	:	w = 3,0 – 4,0 m/s	$V_1 = 1\ 000-2\ 900 \text{ m}^3/\text{h}$
- Collection ducts	:	w = 6,0 – 7,0 m/s	$\Sigma V \sim$ According to cross-section
- Supply ducts	:	w = 5,0 – 6,0 m/s	$\Sigma V \sim$ According to cross-section

### 3) Heat recovery design (HRC)

The vast majority of kitchen ventilation projects benefit economically from a heat recovery system and their installation is recommended. ATREA's plastic plate recovery exchangers can be used for ceilings (in a machine room or integrated in an AHU unit, e.g. RVX, RVZ or DUPLEX systems).

### 4) Automatic HVAC operation control design

For high-performance systems (above  $2,500 \text{ m}^3/\text{h}$ ) it is returnable to install ATREA's automatic operation control to ensure optimum ventilation performance in relation to immediate heat generation from cooking. If the control system is to be included, the order must specify the type and size of fan motors (voltage or frequency speed control).

### 5) Technical clarification and ordering

The customer makes an order with the producer specifying items 1–4, accurately indicating all plan dimensions (including tolerances), heights, shafts including utility passages (gas flues, if any) through the ceiling and specifying the kitchen ceiling type to design the method of fastening. If the wiring is completely installed by ATREA, zones for lighting control and cable routes must be additionally defined. The producer compiles the technical design (including the layout of lights and sensors, if any, and the wiring diagram) and hands it over to the customer with a complete project quote.

## SAMPLE PROJECT SPECIFICATION

### Ceiling specification sample

Type: „B“ – with transparent false ceilings and integrated horizontal collection and supply ducts

Dimensions	:	9 635 x 4 895 mm (tolerance $\pm 15$ mm)
Space height	:	H = 3 120 mm
Ventilation capacity	:	V = 4 800 $\text{m}^3/\text{h}$
Exchange rate	:	n = 32 /h <sup>1</sup> /
HRC	:	External unit DUPLEX
Aut. control	:	Voltage-controlled fans
Lighting	:	Fluorescent – supplied with SKV

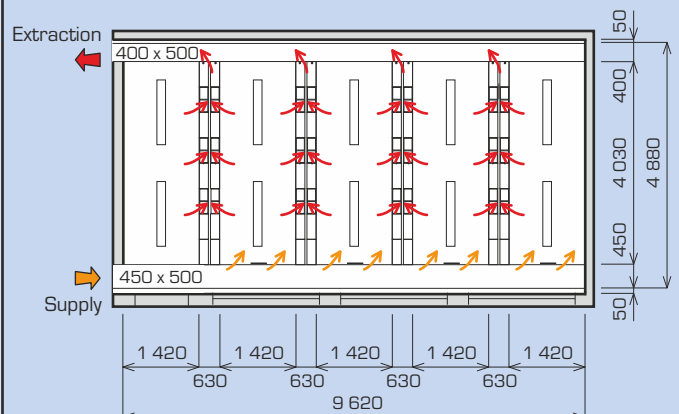


## SAMPLE DESIGN SOLUTION

### Simplified ceiling design sample

Type: „B“ – with transparent false ceiling and integrated horizontal collection and supply ducts

- Extraction ducts	:	630 x 450 mm – length 4 030 mm	- 4 pcs
- Collection ducts	:	400 x 500 mm – length 9 620 mm	
- Supply ducts	:	450 x 500 mm – length 9 620 mm	
- Filters	:	500 x 150 mm – 24 pcs	
- Pressure drop	:	Supply – 80 Pa	Extraction – 105 Pa



# ADVANTAGES, REFERENCES

## ADVANTAGES OF SKV AND TPV CEILINGS

- A closed extraction system eliminates the contamination of the plenum space and surfaces and subsequently the formation of molds
- Low cost
- In-built UVC filtration technology
- Easy and fast installation
- Exhaust air from the kitchen is extracted in a uniform manner across the entire false ceiling area
- Grease filters are located flexibly along the length of ductwork to enable changes to the kitchen equipment layout
- Efficient exhaust air filtration via easily accessible and removable grease filters
- Uniform diffusion indirect lighting across the entire area

- Easy maintenance of transparent false ceilings
- In-built lighting fixtures are fully protected from contamination by grease aerosols
- An outstanding architectonic appearance of modern kitchen interiors
- Versatility to allow installation in existing spaces as well, especially suitable for low and vaulted ceilings
- Simple design solutions
- Ventilation ceilings are approved by the National Institute of Public Health for all types of kitchens
- Certified for use in the EU



## REFERENCES



• Herkules Litvínov •



• Hotel Sklář, Harrachov •



• Army catering facility Vyškov •



• Hotel Imperial, Karlovy Vary •



• ČSOB Prague •



• U Fořta, Hřensko •

and many others in the Czech Republic and abroad