klimaoprema
CLEANROOM SOLUTIONS

CLEANROOMS

TURN-KEY SOLUTIONS

CLEANROOMS | AIR FILTRATION | PROTECTIVE BOOTHS AND CABINETS | CLEAROOM FURNITURE

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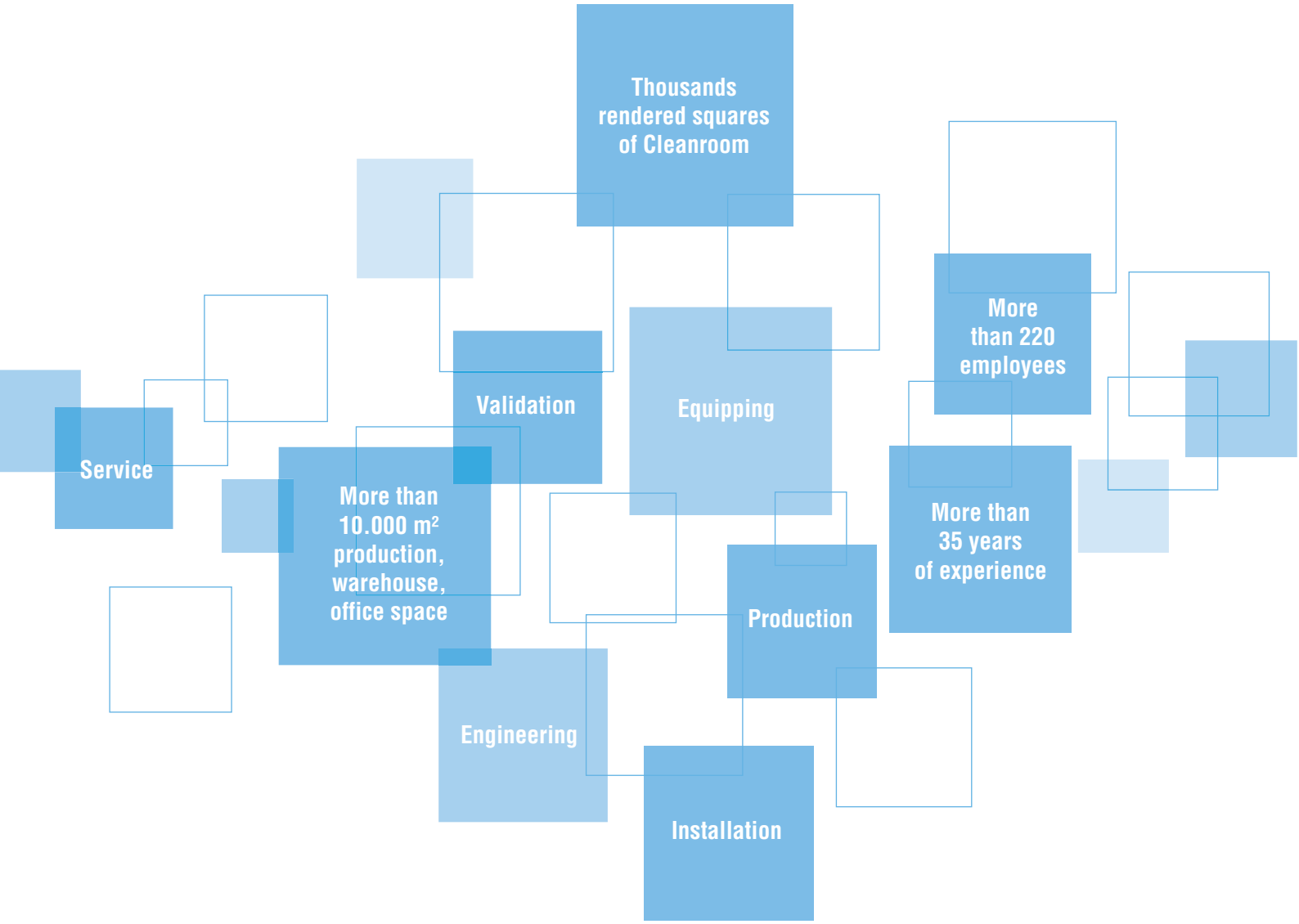


Klimaoprema d.d. is a leading Croatian manufacturer of cleanroom systems, ventilation and air-conditioning equipment.

We offer complete engineering „turn-key" solutions which includes design, engineering, production, installation, validation (GMP classes A, B, C, D), service, ventilation and air-conditioning systems and automatics. The entire "know-how" in this sector is the result of our own research and development.

The experience we gain from our foundation in 1975. until today when Klimaoprema is modern well-organized manufacturing company made up of excellent professionals, engineers and designers, superior quality CNC machinery, test laboratory, ERP information system for business process management, quality management system certified to ISO 9001, programme for product selection and continuing development of new products in compliance with applicable international regulations and standards.

The company employs over 220 people at the central location and registered office in Samobor, Croatia and disposes of 10.000 m² of manufacturing and warehousing area including the offices.

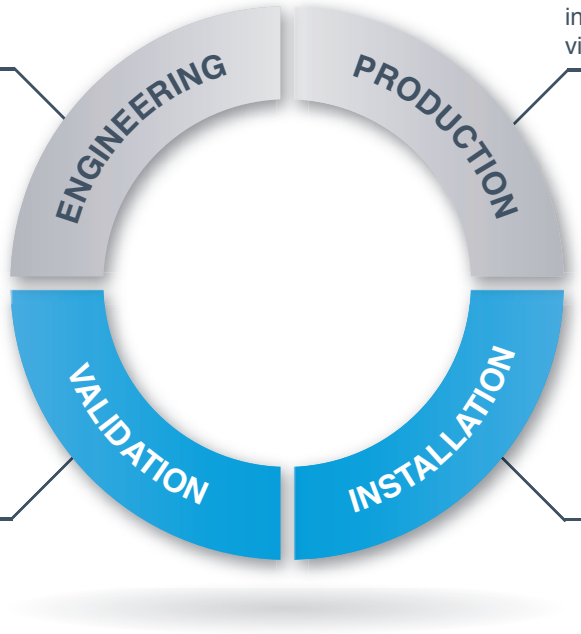
We are a company attractive to people looking for a job, where the existing employees are satisfied and the business partners receive all the assistance they need in project implementation.

Our applications have been confirmed in practice and meet the most stringent regulations pertaining to the pharmaceutical, hospital, chemical and food industries.

This catalog is just a way to meet us. Personal contact and meeting clients special requirements is our mission and our staff, with their knowledge, engineering experience and energy will realize your ideas.

Cleanroom design and engineering in pharmaceutical, medical, food, electronic and other industries

Production of Cleanrooms, Operating rooms, Laminar flow hoods and booths, Microbiological safety cabinets, Weighing/Containment booths, Special devices, Furniture



Validation & Service

Cleanroom installation and equipping

KLIMAOPREMA CLEANROOM SOLUTIONS

We design cleanrooms in pharmaceutical, medical, food, electronic and other industries affected by contaminants from the environment and other sources.

The first phase of the design is the creation of Conceptual design. The second phase is making Basic design. The third phase is making Detailed design. At the end As-build design is done.

Each high-quality manufacturing plant rises from a good foundation, which makes initial phase of making Conceptual design important. Here the estimate of the investment is done. The dimensions of the object and scope of the project are being defined. Scope of the project consists of manufacturing processes, the equipment list, energy sources that will be used and the necessary infrastructure.

Production processes are carried out in a number of high production lines and CNC machines that guarantee minimal production time and products of world-class quality.

Complete manufacturing process is controlled by ERP information system that guarantees efficient flow of information needed for quick response.

As a company focused to future we constantly strive for new opportunities and innovative solutions. We encourage originality and creativity of individuals and teams in order to offer customers the equipment for cleanrooms, air-conditioning and ventilation systems, which ensure healthy and pleasant stay in the area and energy efficiency of the plant.

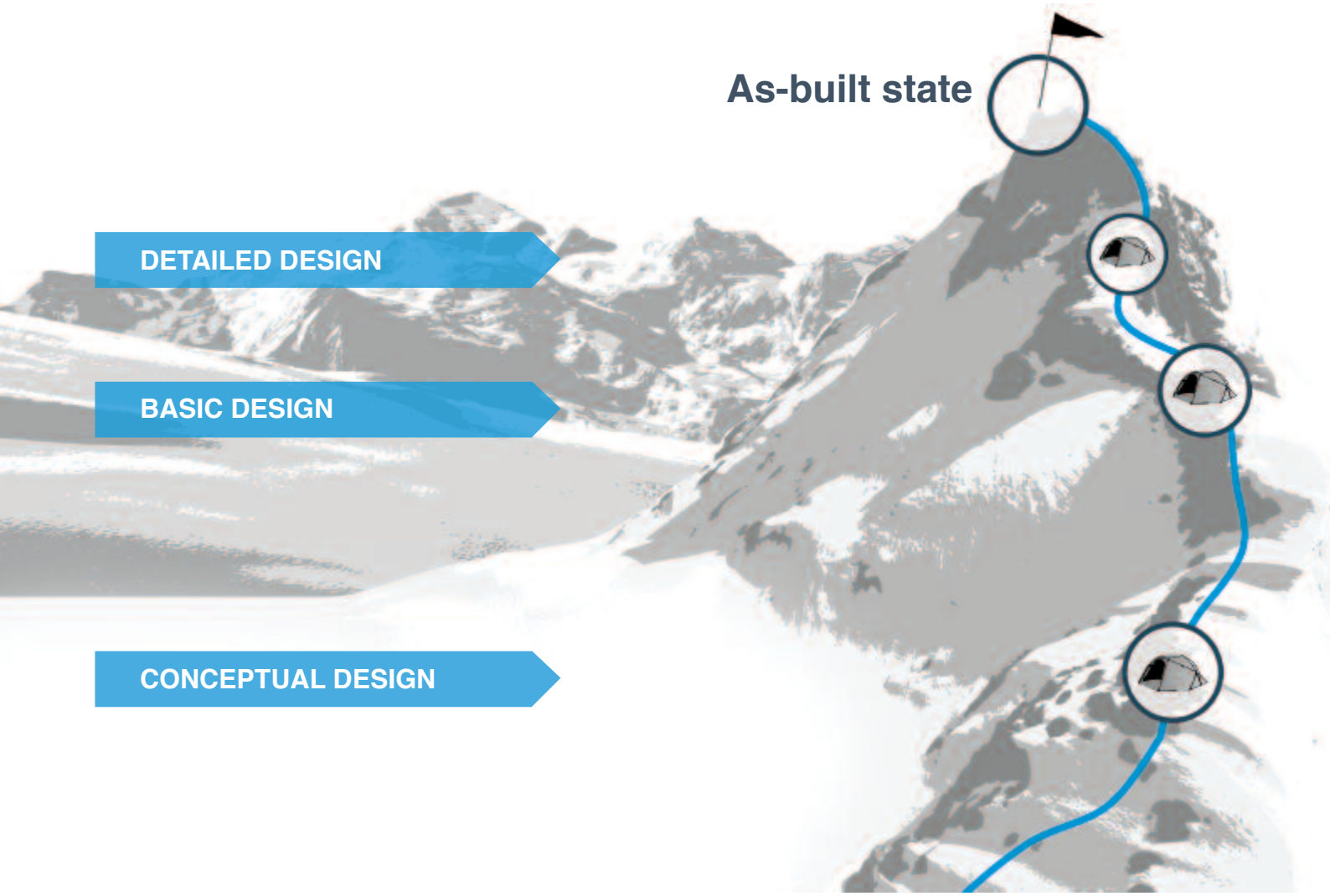
Cleanroom installation will be done by our experienced workers, in short time space will become pure cleanroom area that meets all of the guidelines and standards.

Service in a cleanroom area means maintaining the building and validation of the unit and complete cleanroom space. It is about maintaining the newly built or reconstructed cleanroom space and related facilities. Regular servicing, maintenance and validation of equipment or facility ensure safety in use and longer life of the equipment.

DESIGN AND ENGINEERING

We design cleanrooms in pharmaceutical, medical, food, electronic and other industries affected by contaminants from the environment and other sources.

- **Technological solutions**
- **Architectural solutions**
- **HVAC design**
- **Electrical wiring**
- **DDC & BMS**



Design carried out in accordance with national regulations and standards as well as GMP and FDA Guidelines.

Development of an acceptable design in terms of an investment amount. We tailor our services to each customer separately, listening to their needs and desires. We propose solutions and design, develop and realize the customer's vision.

CLEANROOMS BASED ON TURNKEY PROJECTS

Cleanrooms refer to spaces in which surgery, scientific research and actions are performed during which the contact with pollutants such as dust, airborne microbes and aerosol particles must be avoided. Today cleanrooms are part of all manufacturing facilities in pharmaceutics, biotechnology, chemical, food, dairy and other industries sensitive to contaminants from the environment.

Cleanroom is a defined and controlled space designed to minimize and control entry, generation, collection, and retaining of particles (contaminants). The space in which the filtered air is blown into has a positive pressure compared to surrounding areas under all operating conditions and the air is effectively washed out. The space in which all relevant parameters: temperature, relative humidity, noise, lighting, and other parameters are strictly controlled.

Klimaoprema Cleanroom Solutions design cleanrooms that meet the requirements for the number of particles at-rest and in operation. The requirements are defined for each room (class) separately.

Cleanrooms are classified according to the number and size of particles permitted per volume of air. The standards define air purity. Large-scale numbers like „class 100“ or „class 1000“ refer to the US FED STD 209E and indicate the number of particles in size of 0.5 µm or larger particles per cubic foot of air. Therefore, class 100 according to US FED 209E standard provides that the number of particles in size of 0.5 µm or larger sizes must not exceed the value of 100 particles per 1 ft^3. Small-scale numbers refer to ISO 14644-1 standards determining decimal logarithm of the particle numbers in size of 0.1 µm or larger particles per cubic meter of air. Accordingly, for example, a cleanroom ISO class 5 has the maximum of 105 = 100,000 particles per m^3. Since 1 m^3 is approximately equal to 35 ft^3, these two standards are relatively equal when it comes to measuring particles of 0.5 µm, although the testing standards are different. A common indoor air approximately belongs to the class 1.000.000 or ISO 14644-9.

Required guidelines in the cleanrooms design are GMP (Good Manufacturing Practice), the guidelines under whose principles and instructions the manufacturing organization in the pharmaceutical industry should be carried out and documented. GMP provides immediate and consistent quality control. Our employees continually adopt new technologies, improving the quality of products and fulfilling strict requirements and standards being applied in the cleanroom design.

Knowing the design and production technique for cleanrooms we carry out full scope of the project as well as equip the cleanrooms. We are permanently oriented to customers whose needs are monitored and analysed with special care by designing cleanrooms in pharmaceutical plants, hospitals, pharmacies, production facilities in food industry, engineering plants, electronic industry plants and so on.

As the leading manufacturer of cleanroom equipment in Croatia and the region, Klimaoprema Cleanroom Solutions has proven its quality not only by the finishing product, but through knowledge and professionalism of staff that perform delivery, installation, manufacturing and communication with business partners. **Contact us with confidence and Klimaoprema Cleanroom Solutions will design, manufacture, assemble and equip your cleanroom according to your inceptive idea, as well as validate and service it during use.**

CLEANROOMS
Components

Cleanroom is designed in the same way the house is designed. All the elements that make up a house like walls, ceilings, windows, doors, floors and other components also comprise a cleanroom. The house is a safe home to the house owner, as well as the cleanroom is a safe place for operators, pharmacists, surgeons and other staff.

Cleanrooms must be designed, constructed and adapted to fit operations performed in them. The project is carried out so as to reduce the risk of contamination, dust and other impurities to a minimum probability.
Lighting, temperature, humidity and ventilation must comply with the requirements of the operation and shall not affect the quality of actions or the functioning of the equipment.

It would be best to if the flow of people, materials and equipment would be unidirectional to the largest possible extent to avoid the possibility of mixing and contamination.

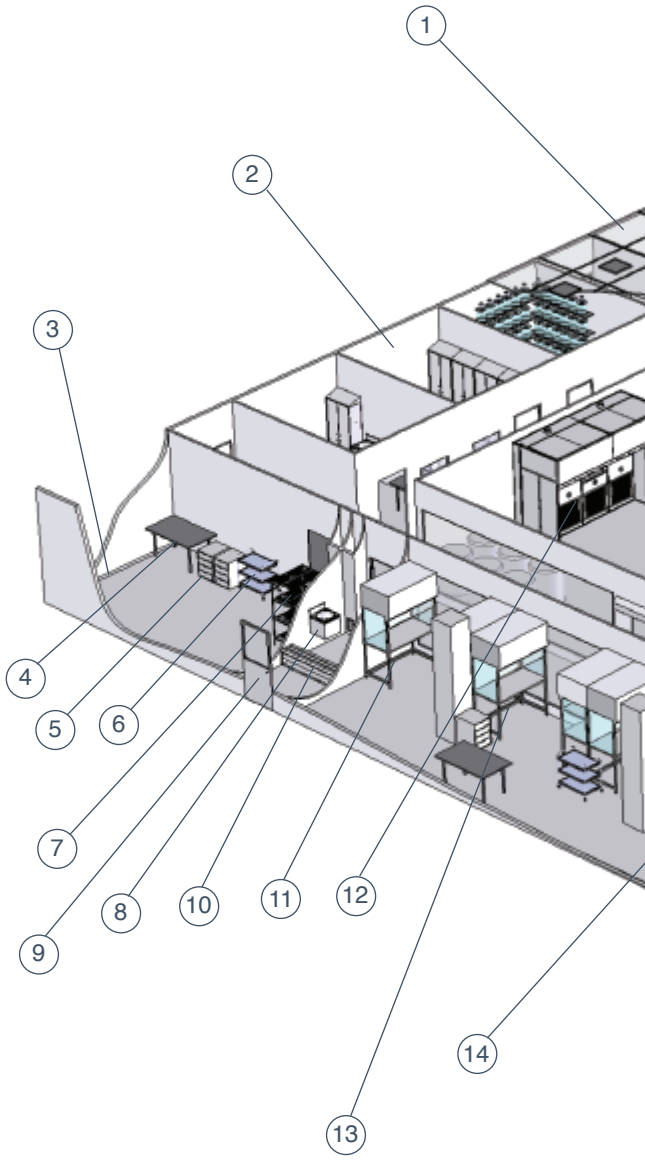
Workspace schedule must allow for an orderly and logical distribution of the materials and equipment in order to avoid the possibility of cross-contamination and exclude the risk of omitting or replacing any phase of the operation or control.

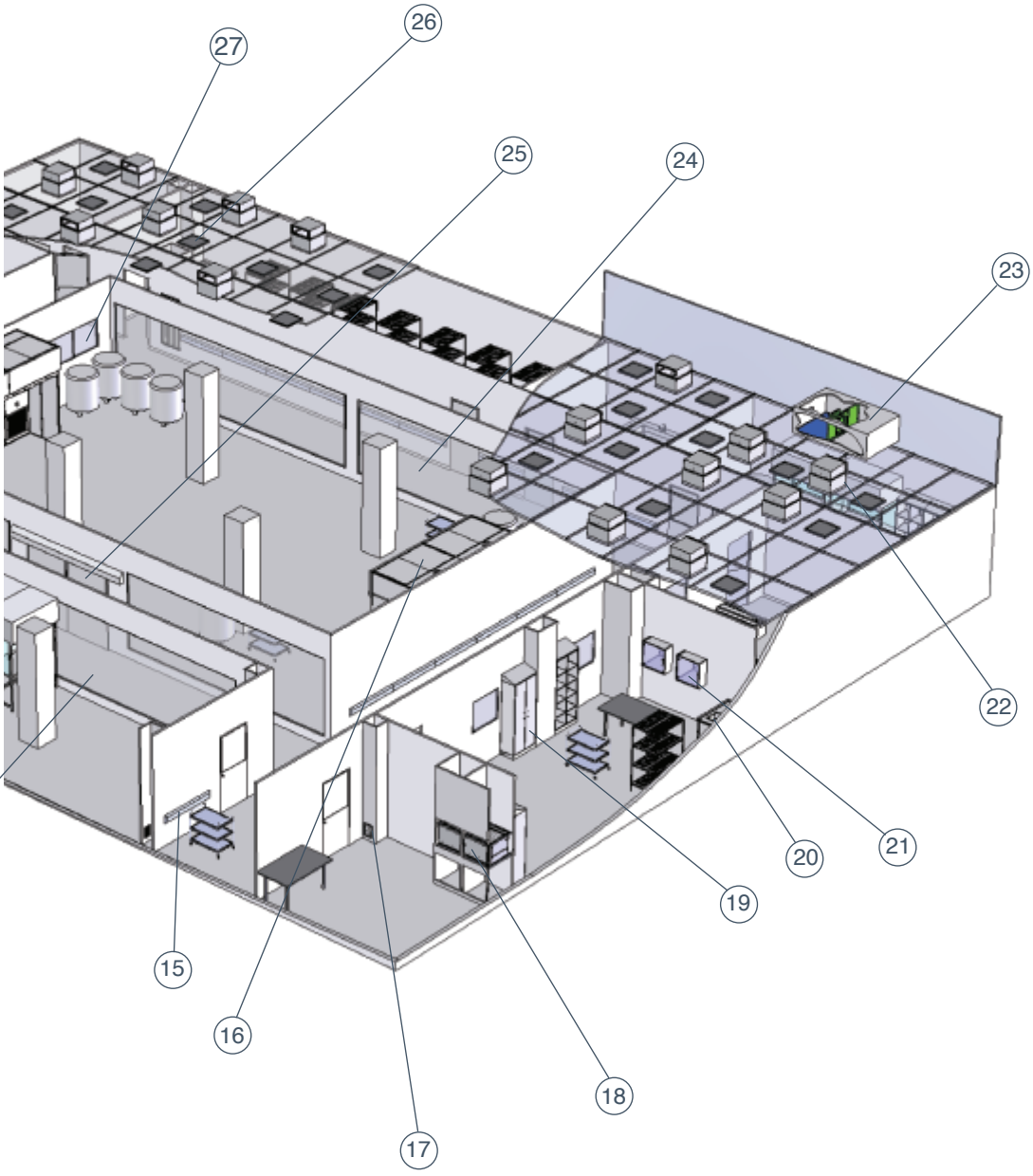
Walls, ceilings and floors in cleanrooms should be made of watertight material, smooth, crack-free and easily washable, while the finishing processing of walls, ceilings and floors must be rounded.

The basic process fuels are an integral part of the plant, and their distribution to the place of consumption should be carried out the shortest routes as possible while the connection to the equipment should be made from the ceiling.

When designing and installing power lines and fittings it would be best to avoid dents and provide for their maintenance outside the cleanroom.
The drains should be of adequate size and with no possibility of overflowing, i.e. back flowing.

It is necessary to ensure an adequate exhaust system to control contaminants in case of a possible contamination of space, as well as to maintain the required cleanliness of the room.
It is necessary to provide adequate electrical wiring and power.
The access to the facility must be controlled and limited to authorized persons via a controlled-access or a card reader.





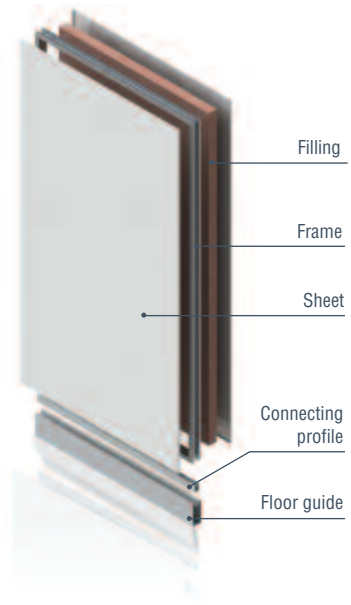
1. Ceiling panels
2. Wall panels
3. Oval profiles
4. Table
5. Drawer
6. Cart
7. Shelves
8. Sink
9. Swing door
10. Bench
11. Laminar flow hood
12. Weighing/Containment booth
13. Microbiological safety cabinet
14. Glass wall
15. Bumper
16. Laminar flow booth
17. Exhaust grille
18. Safe exchange housing
19. Cabinet
20. Sink
21. Pass box
22. Absolute ceiling filter FAC
23. Air-handling unit
24. Floor
25. Sliding doors
26. Lamps
27. Window

Wall panels

SPECIFICATION

- The panel, as a wall segment, is made of double-walled sheet folded around the edges (sandwich panels), reinforced with a frame
- Panel walls can be made from:
  - Galvanized steel sheet laminated in colour 25 µm thick
  - Aluminium sheet laminated in colour 60 µm thick
  - Galvanized steel sheet laminated in antibacterial colour 110 µm thick
  - Aluminium sheet laminated in antibacterial colour 110 µm thick
  - Stainless sheet (option: lamination in antibacterial colour 110 µm thick)
- The panel walls are filled with expanded polyester (EPS - styrofoam) or rockwool giving the panel excellent mechanical, thermodynamic and damping properties
- Panels are designed as watertight - all the grooves between the panels are filled with cleanroom silicone
- Channels for distribution of electrical wiring are provided within the panel system
- Standard wall colour is RAL 9002, other colours available on request
- Panel thickness: 42, 62, 82 mm
- Option: walls with **lead protection, radiation protection**

WALL PANEL - COMPONENTS



PROPERTIES

- Strength
- Smooth bump free surface
- Easy cleaning and maintenance
- Porous, water-repellent
- Resistance to abrasion, chemicals
- Thermal and sound insulation
- Corrosion protection
- Longevity

ASSEMBLY

- Panels are mounted in a rigid aluminium floor profile
- Fixing carried out via aluminium "H" profile (before laying the floor) or "U" profile (on the laid down floor)
- Connection of the panels by aluminium compounds filled with cleanroom silicone
- A part of the panel is designed as prefabricated detachable piece to enable entry/exit of heavy equipment
- Easy assembly and disassembly in case of changes
- The panels are designed with planned apertures for installation of exhaust grilles

Option 1. Floor aluminium profiles mounted on the construction levelled floor, followed by the installation of PVC or Epoxy floor

Option 2. Profiled aluminium floor profiles mounted on the finished floor (PVC or Epoxy)

TECHNICAL DATA

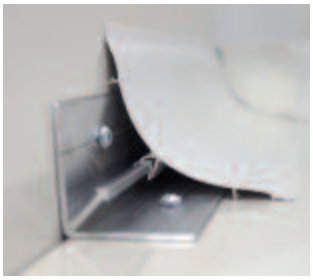
WALL PANELS 42/62/82 mm							
Type	**CRWPAN GS RW**	**CRWPAN AL RW**	**CRWPAN ST RW**	**CRWPAN GS PS**	**CRWPAN AL PS**	**CRWPAN ST PS 42 or 82 mm**	**CRWAB PS or RW**
Description	Modular Cleanroom LINING panels without visible substructure - 42 mm Modular Cleanroom LINING and SCREENING panels without visible substructure - 62, 82 mm						
Thickness	42 mm OR 62 mm OR 82 mm (± 1 mm)						
Dimensions	Depending on the project requirements Max. panel dimensions from one piece 1200 x 4000 mm (width x height)						
Wall/lining	Galvanized steel sheet 0.8 mm	Aluminium sheet 1.0 mm	Stainless sheet 0.8 mm	Galvanized steel sheet 0.8 mm	Aluminium sheet 1.0 mm	Stainless sheet 0.8 mm	Antibacterial aluminium sheet 1.0 mm
Fine finish	Varnished polyester 25 microns with a separate protective film	Lamination 60 microns with a separate protective film	Different surfacing finishes available	Varnished polyester 25 microns with a separate protective film	Lamination 60 microns with a separate protective film	Different surfacing finishes available	Lamination PVC coating thickness 110 microns
Colour	RAL 9002 Other RAL colours available on request		-	RAL 9002 Other RAL colours available on request		-	RAL 9002 Other RAL colours available on request
Filling	Rockwool (100 kg / m³), Class A1 Panel reaction to fire according to the standard: EN 13501-1+A1:2009, A2-s1, d0			Styrofoam (30 kg/m³)			Rockwool or styrofoam
Weight/m²	42 mm - 15 kg 62 mm - 17 kg 82 mm - 19 kg	42 mm - 9 kg 62 mm - 11 kg 82 mm - 13 kg	42 mm - 5 kg 62 mm - 17 kg 82 mm - 19 kg	42 mm - 13 kg 62 mm - 14 kg 82 mm - 14 kg	42 mm - 7 kg 62 mm - 8 kg 82 mm - 8 kg	42 mm - 13 kg 62 mm - ------ 82 mm - 14 kg	42 mm - 13 kg 62 mm - 14 kg 82 mm - 14 kg
Connection	Connection profile						
Floor profile	Aluminium base profile h = 100 mm or U profile						

Other dimensions enabled on request.

MARKS	
CRWPAN	Cleanroom Wall Panel
GS	Galvanized steel sheet
AL	Aluminium sheet
ST	Stainless steel
RW	Rockwool
PS	Styrofoam
CRWAB	Cleanroom Wall Panel Antibacterial

OVAL PROFILES

- All ceilings and wall joints constructed rounded
- All floor and wall joints constructed rounded
- Oval profiles are used to cover aluminium profiles vertically or horizontally connecting the walls with the ceilings
- Made from PVC or aluminium



PVC oval profile

Aluminium oval profile

Antibacterial panels

ANTIBACBERIAL SPECIFICATIONS

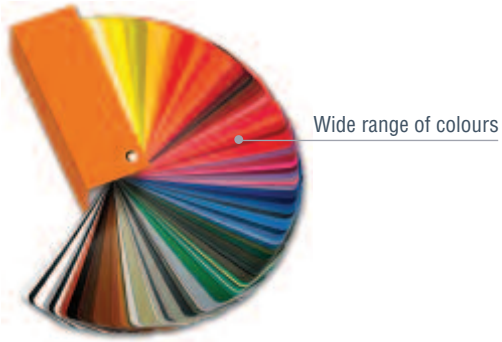
- Antibacterial coating 110 microns thick
- Antibacterial properties are activated in the presence of environmental conditions enabling growth of bacteria, fungi and algae
- Double action: prevents formation of bacteria and eliminates the existing ones
- Long-term protection, even with standard cleaning
- Wide range of colours, highlighting on pastel colours, most commonly used in pharmaceutical industry

AREAS OF APPLICATION

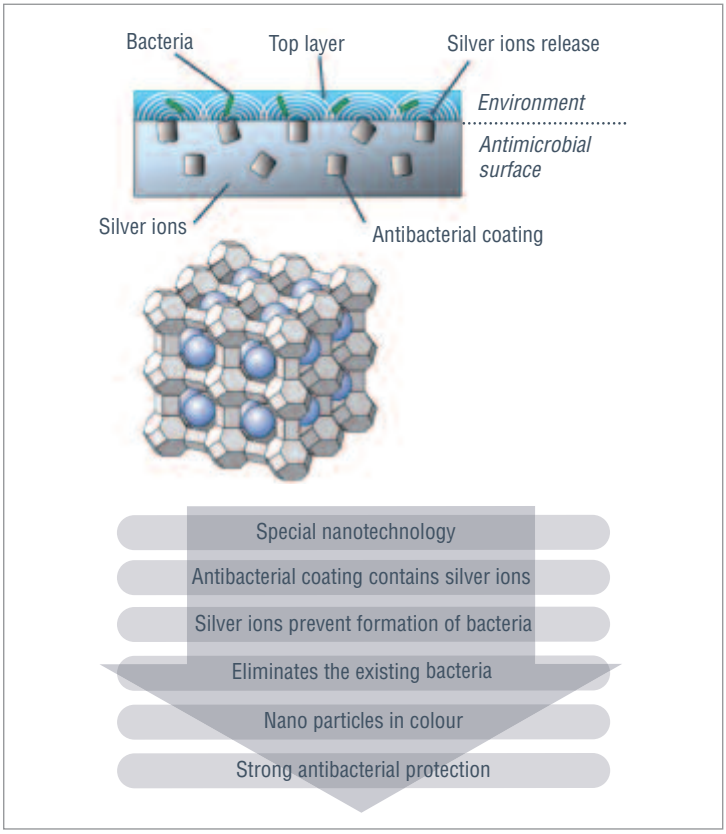
- Pharmaceuticals
- Laboratories
- Microelectronics
- Food industry
- Hospitals
- Medical and dental clinics
- Research institutes

PROPERTIES

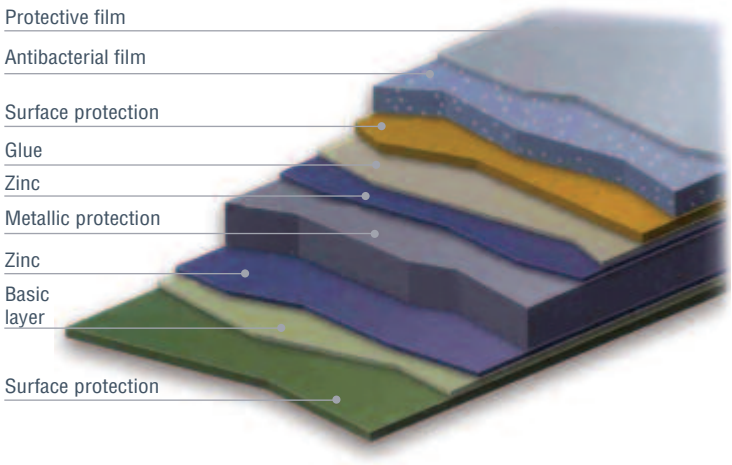
- Longevity and durability
- Smooth bump free surface
- Easy cleaning and maintenance
- Porous, water-repellent
- Chemical resistance
- Heat resistance
- Resistance to micro-organisms
- Resistance to corrosion and scratches

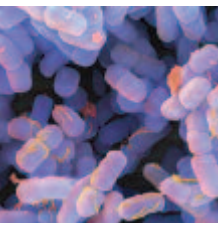


ANTIBACBERIAL SPECIFICATIONS EFFECT

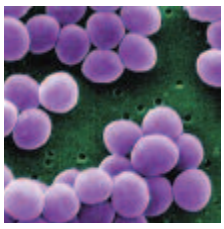


ANTIBACTERIAL COATING

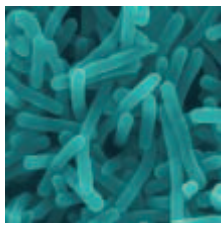


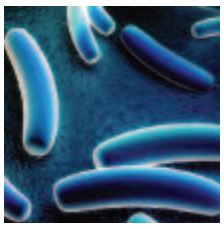

Escherichia Coli

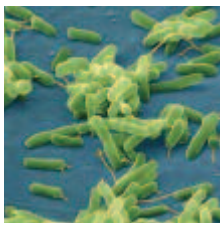

Klebisella pneumoniae


Staphylococcus aureus


Salmonella typhimurim


Listeria monocytogenes


Legionella pneumophila


Pseudomonas aeruginosa

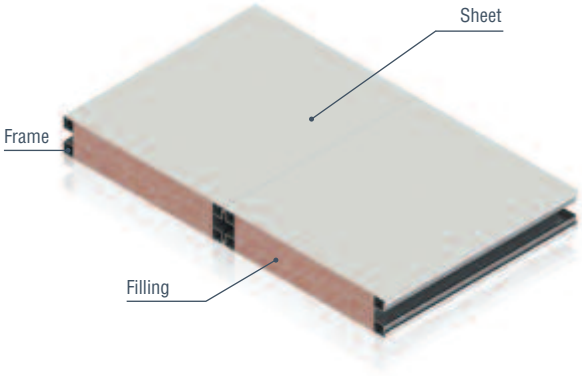
Tests confirmed antibacterial properties in preventing above mentioned bacteria, with over 99% efficiency

Ceiling panels

SPECIFICATION

- The panel, as a ceiling segment, is made of double-walled sheet folded around the edges (sandwich panels), reinforced with a frame
- Panel ceilings can be made from:
  - Galvanized steel sheet laminated in colour 25 µm thick
  - Aluminium sheet laminated in colour 60 µm thick
  - Galvanized steel sheet laminated in antibacterial colour 110 µm thick
  - Aluminium sheet laminated in antibacterial colour 110 µm thick
  - Stainless sheet (option: lamination in antibacterial colour 110 µm thick)
- The panel ceilings are filled with expanded polyester (EPS - styrofoam) or rockwool giving the panel excellent mechanical, thermodynamic and damping properties
- Panels are designed as watertight - all the grooves between the panels are filled with cleanroom silicone
- Channels for distribution of electrical wiring are provided within the panel system
- Standard ceiling colour is RAL 9002, other colours available on request
- Panel thickness: 42, 62, 82 mm
- Ceilings are walkable (100 kg), impassable ceilings available on request
- Option: Ceilings with **lead protection, radiation protection**

CEILING PANEL - COMPONENTS



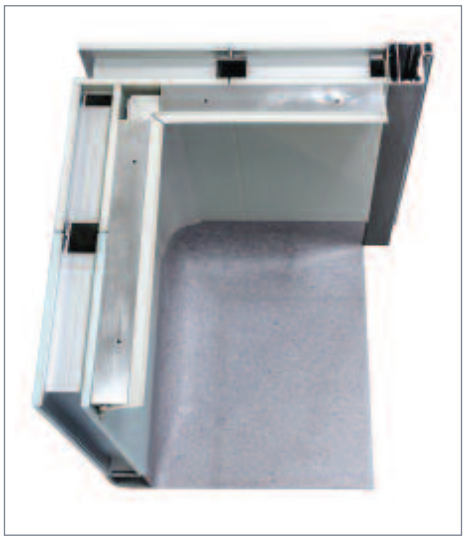
PROPERTIES

- Strength
- Smooth bump free surface
- Easy cleaning and maintenance
- Porous, water-repellent
- Resistance to abrasion, chemicals
- Walkable
- Thermal and sound insulation
- Corrosion protection
- Longevity

ASSEMBLY

- Ceiling panel system consist suspension for mounting of concrete or steel structure, ceiling invisibly suspended
- Installation of a standard 1.2 x 2.4 m suspended ceiling (depending on the shape and size of the room)
- Ceiling contains apertures for installation of diffusers, lamps, skylights, joints filled with a cleanroom silicone
- Easy assembly and disassembly in case of changes

Ceiling panels



Channels for distribution of electrical wiring

TECHICAL DATA

CEILING PANELS 42/62/82 mm							
Type	**CRCPAN GS RW**	**CRCPAN AL RW**	**CRCPAN ST RW**	**CRCPAN GS PS**	**CRCPAN AL PS**	**CRCPAN ST PS**	**CRCAB PS or RW**
Description	Modular Cleanroom LINING panels without visible substructure						
Thickness	42 mm OR 62 mm OR 82 mm (± 1 mm)						
Dimensions	Depending on the project requirements Max.panel dimensions from one piece 1200 x 4000 mm (width x height)						
Wall/lining	Galvanized steel sheet 0.8 mm	Aluminium sheet 1.0 mm	Stainless sheet 0.8 mm	Galvanized steel sheet 0.8 mm	Aluminium sheet 1.0 mm	Stainless sheet 0.8 mm	Antibacterial aluminium sheet 1.0 mm
Fine finish	Varnished polyester 25 microns with a separate protective film	Lamination 60 microns with a separate protective film	Different surfacing finishes available	Varnished polyester 25 microns with a separate protective film	Lamination 60 microns with a separate protective film	Different surfacing finishes available	Lamination PVC coating thickness 110 microns
Colour	RAL 9002 Other RAL colours available on request		-	RAL 9002 Other RAL colours available on request		-	RAL 9002 Other RAL colours available on request
Filling	Rockwool (100 kg / m³), Class A1 Panel reaction to fire according to the standard: EN 13501-1+A1:2009, A2-s1, d0			Styrofoam (30 kg/m³)			Rockwool or styrofoam
Weight/m²	42 mm - 15 kg 62 mm - 17 kg 82 mm - 19 kg	42 mm - 9 kg 62 mm - 11 kg 82 mm - 13 kg	42 mm - 5 kg 62 mm - 17 kg 82 mm - 19 kg	42 mm - 13 kg 62 mm - 14 kg 82 mm - 14 kg	42 mm - 7 kg 62 mm - 8 kg 82 mm - 8 kg	42 mm - 13 kg 62 mm - 14 kg 82 mm - 14 kg	42 mm - 13 kg 62 mm - 14 kg 82 mm - 14 kg
Connection	Connection profile						
Suspension	Invisible suspension mounted on a concrete or steel structure						

Other dimensions enabled on request.

MARKS	
CRCPAN	Cleanroom Ceiling Panel
GS	Galvanized steel sheet
AL	Aluminium sheet
ST	Stainless steel
RW	Rockwool
PS	Styrofoam
CRCAB	Cleanroom Ceiling Panel Antibacterial

Cleanroom windows

SPECIFICATION

- Windows are an integral part of the wall panel
- Window thickness equals the thickness of the wall panel
- Windows are made of double glazing 6 + 6 mm
- Window frames contain silica gel that absorbs moisture, prevents condensation in the space between two glasses
- Glass walls - a window designed as a glass wall from special profiles and a single glass 10 mm thick
- Cleanroom windows and glass walls are made in dimensions according to the project requirements
- Optional: built-in blinds for protection from sun or views, automatic adjustment (remote control)
- Optional: self shading glass, automatic adjustment (remote control, touch-screen)

WINDOW - COMPONENTS

PROPERTIES

- Strength
- Smooth bump free surface
- Easy cleaning and maintenance
- Porous, water-repellent
- Anti-condensation

ASSEMBLY

- Windows fit into aluminium profile are mounted in panels
- Joints filled with a cleanroom silicone

TECHICAL DATA

CLEANROOM WINDOWS						
Type	**CRW 42 AL 900 mm**	**CRW 42 AL 1200 mm**	**CRW 62 AL 900 mm**	**CRW 62 AL 1200 mm**	**CRW 82 AL 900 mm**	**CRW 82 AL 1200 mm**
Description	Cleanroom window, double glazing 6 +6 mm, filled with silica gel					
Thickness	42	42	62	62	82	82
Height	900	1200	900	1200	900	1200
Dimensions	600 x 900 900 x 900 1200 x 900 1500 x 900 1800 x 900	600 x 1200 900 x 1200 1200 x 1200 1500 x 1200 1800 x 1200	600 x 900 900 x 900 1200 x 900 1500 x 900 1800 x 900	600 x 1200 900 x 1200 1200 x 1200 1500 x 1200 1800 x 1200	600 x 900 900 x 900 1200 x 900 1500 x 900 1800 x 900	600 x 1200 900 x 1200 1200 x 1200 1500 x 1200 1800 x 1200

Other dimensions enabled on request.

MARKS	
CRW	Cleanroom Window
AL	Aluminium frame

Cleanroom doors

SPECIFICATION

- Doors are made of cleanroom panels and aluminium, filled with rockwool, hard styrofoam or aluminium honeycomb
- Windowed or windowless design is optional (dimensions per request)
- Glazing within door hinges without joints, slots, etc...
- Built-in lock with key and door handle from stainless steel or a ball
- On the floor side of the door automatic sliding rubber seal which prevents circulation of air under the door (keeping the pressure difference in space) is installed
- Standard colour is RAL 9002, other colours available on request
- Doors in class areas (pressure regimes) secured by self-closing mechanisms, ensures maximum adhesion, magnet
- Doors are structured so as to enable preservation of overpressure in the room
- Optional: opening for exhaust grille
- Control: manual or automatic

HYDRAULIC PUMPS

- Weaker, for door hinges with widths up to 1100 mm
- Stronger, for door hinges with widths up to 1400 mm
- Adjustable closing force, depending on the pressures on the premises
- Closing speed and door stopping adjustment is possible
- For right or left side (pulling or pushing)
- Optical indicator of closing force
- Toothed stop with sliding guide for sliding doors

CLEANROOM DOOR TYPES

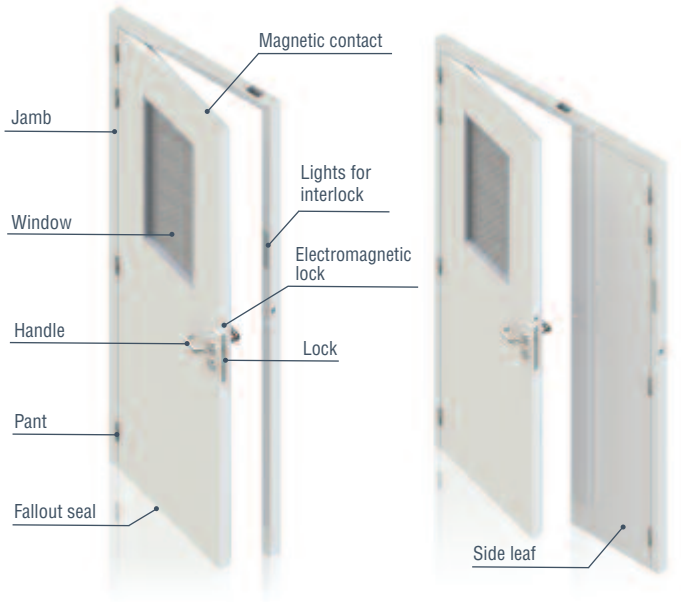
- Manual/automatic swing door, one leaf
- Manual/automatic sliding door, one leaf
- Manual swing double leaf door, symmetric/asymmetric
- Automatic swing double leaf door, symmetric/asymmetric
- Manual/automatic sliding double door, symmetric

PROPERTIES

- Strength
- Smooth bump free surface
- Easy cleaning and maintenance
- Porous, water-repellent
- Resistance to abrasion, chemicals
- Thermal and sound insulation
- Corrosion protection
- Longevity

DOOR - COMPONENTS

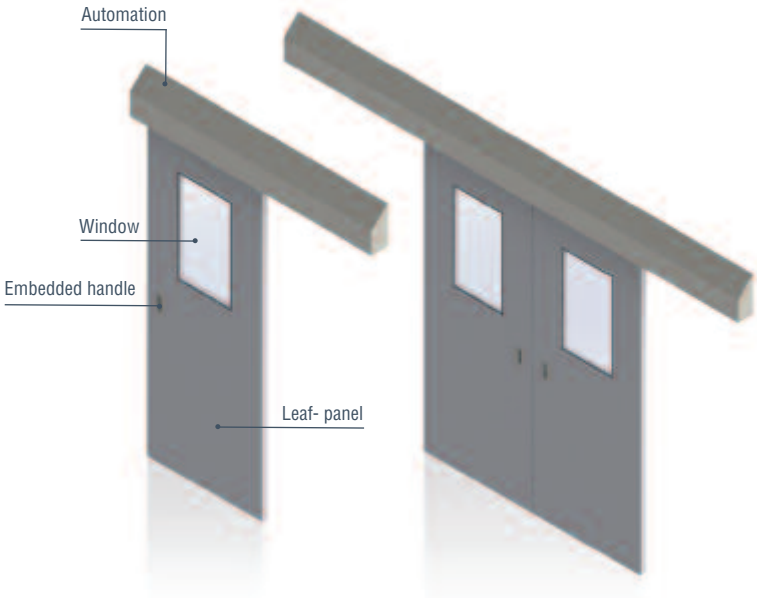
Swing door



One leaf swing door

Double leaf swing door

Sliding door



One leaf sliding door

Double leaf sliding door

INTERLOCK SYSTEMS

- Possibility of various system programing
- When the door in the closed system is locked, the LED shows green light, when one door opens, other doors are automatically locked and LED light shows red light
- When several doors are opened, the alarm and light indication appear
- Push panic button in case of alarm automatically unlocks all doors
- Ability to install authorized entrance by security card


Double leaf sliding door


One leaf swing door


Keyhole


Movable rubber seal


Hydraulic pump


Interlock

TECHICAL DATA

CLEANROOM DOOR DIMENSIONS				
Type	**Dimensions (width x height)**	**Filling**	**Lock with key**	**Window**
One leaf swing door CRDAB or CRD 62 AL One leaf swing door with a window CRDWAB AL or CRDW 62 AL	800 x 2200/82/62 mm 900 x 2200/82/62 mm 1000 x 2200/82/62 mm 1100 x 2200/82/62 mm 1200 x 2200/82/62 mm	Hard styrofoam or rockwool with thickness of 82/60 mm or al. honeycomb (62)	Yes	Both sides 6 + 6 mm in hinge plane 400 x 700 mm
Double leaf swing door CRDAB AL or CRD 62 AL Double leaf swing door with a window CRDWAB AL or CRDW 62 AL	1300 x 2200/82/62 mm 1400 x 2200/82/62 mm 1500 x 2200/82/62 mm 1600 x 2200/82/62 mm 1700 x 2200/82/62 mm 1800 x 2200/82/62 mm 1900 x 2200/82/62 mm 2000 x 2200/82/62 mm 2100 x 2200/82/62 mm 2200 x 2200/82/62 mm	Hard styrofoam or rockwool with thickness of 82/60 mm or al. honeycomb (62)	Yes	Both sides 6 + 6 mm in hinge plane 400 x 700 mm
Sliding one leaf door with or without windows CRDSAB AL	800 x 2200/42 mm 900 x 2200/42 mm 1000 x 2200/42 mm 1100 x 2200/42 mm 1200 x 2200/42 mm 1300 x 2200/42 mm	Hard styrofoam or rockwool or al. honeycomb (62)	No	Both sides 6 + 6 mm in hinge plane 400 x 700 mm
Sliding double leaf door with or without windows CRDSAB AL	1300 x 2200/42 mm 1400 x 2200/42 mm 1500 x 2200/42 mm 1600 x 2200/42 mm 1700 x 2200/42 mm 1800 x 2200/42 mm 1900 x 2200/42 mm 2000 x 2200/42 mm 2100 x 2200/42 mm 2200 x 2200/42 mm	Hard styrofoam or rockwool or al. honeycomb (62)	No	Both sides 6 + 6 mm in hinge plane 400 x 700 mm

MARKS	
CRD	Cleanroom door
CRDS	Cleanroom door sliding
CRDW	Cleanroom door window
CRDAB	Cleanroom door antibacterial
CRDSAB	Cleanroom door sliding antibacterial
CRDWAB	Cleanroom door window antibacterial
AL	Aluminium sheet
AL-HC	Aluminium honeycomb

Other dimensions enabled on request.

Cleanroom floors

SPECIFICATION

- Electrically conductive, granular structure
- Antistatic
- Chemical, mechanical stain and heat resistance
- No visible traces of wear
- No joints, sealed connections
- Waterproof
- Slip-resistant
- Surface is resistant to wear, suitable for frequent cleaning
- Wide selection of colours and designs
- Durability: from 15 to 40 years

SAFETY FEATURES

- Fire safety EN 13501-1: Bfl-S1 (DIN 4102 B1), several types
- Slip-resistance BGR 181 group R10, more options
- Footstep sound dumping ISO 140-8: 3 dB

FLOOR SURFACE MINIMUM REQUIREMENTS

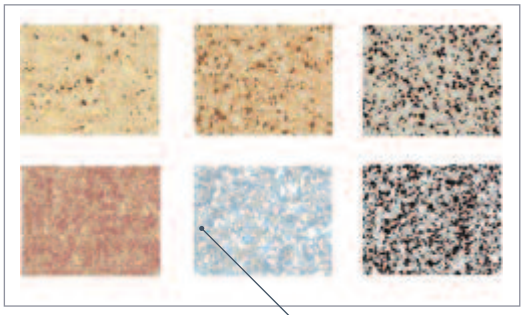
- Transient resistance EN 1081: ≤1 x 106 Ω, for electro-conductive floors
- Thickness EN 428: 2.2 mm
- Resistance to tear and wear, chemicals 31/43
- Thermal conductivity EN 12524: 0.25 W / mK
- Residual imprints EN 433: 0.04
- Blade mass EN 430: 2900 g/m²
- Compressive strength: 80N/mm²
- Adhesion: >3N/mm²
- Mechanical elasticity: 15'000N/mm²
- Hardness: Sh.75
- High chemical resistance: DIN 53454, 53452, 53750, ISO 868

CLEANROOM FLOOR TYPES

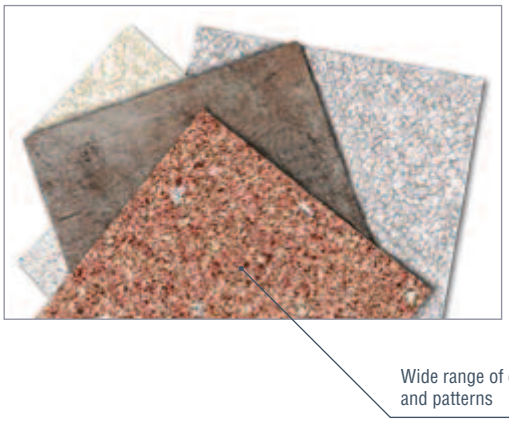
- EPOXY
  - Compact smooth surface without pores, made of epoxy resin with powder granules at PU base
  - Performed on the smoothed concrete surface or cement screed
  - Suitable for pharmaceutical industry

- PVC
  - Highly impregnated PVC, polyvinyl chloride
  - Most often carried out on cement screed

EPOXY



PVC



Cleanroom lamps

SPECIFICATION

- Metal casing, laminated in white colour, other colours on request
- The lamps are equipped with 14W, 24W, 28W, 54W and 55W TC-L, adequate light and temperatures with high energy efficiency
- As a whole in the panel system they ensure air-tightness i.e. overpressure in a cleanroom
- Transparent or mat tempered glass, combined with adequate reflector
- For cleanrooms, operating rooms, intensive care wards, laboratories

ASSEMBLY

- Installation into the ceiling panel
- Pipe replacement in lamps either from the technical area or cleanroom

TECHICAL DATA

	Fluorescent pipes	Protection
Cleanroom lamps	4 x 14W	IP 54, IP 65, IP 66
	4 x 24W	
	2 x 28W	
	2 x 54W	

Other dimensions enabled on request.

MECHANICAL INSTALLATIONS

AIR-HANDLING UNITS - devices for air treatment

SPECIFICATION

- Smooth, bump free panels
- Panel inner surface is made of laminated galvanized sheet, stainless sheet or seawater resistant sheet (AlMg)
- All device parts are nonporous and do not absorb moisture
- All parts of the device are resistant to cleaning agents and disinfection
- Easy access to device parts for cleaning and disinfection
- Devices equipped with louvers in air-tight design (according to DIN 1946 Part 4)
- Safe condensation drainage system
- Steam humidifiers
- Energy recovery systems for utilization of waste air energy
- Fans and motors protected against corrosion on the movable frame for easier cleaning and disinfection
- Easily accessible sound attenuators
- Option: Air-handling units in **Ex design**

CONSTRUCTION REQUIREMENTS

- Use of materials which do not endanger health and prevent formation of harmful microorganisms
- Inner surfaces of the device are made from tear and wear, cleaning and disinfection resistant materials
- Ensure availability for inspection, cleaning and disinfection of all air duct parts

FILTERS

- Bag filters in the 1st filtration stage, class F5 or higher, in the 2nd stage class F7 filtration or higher
- G4 and F5 filter class to protect heat exchanger
- F7 filter class or more to reduce air pollution in ventilation ducts and protection of HEPA filters on the distribution elements

FUNCTIONAL UNITS

- **Suction/outlet mixing unit**
  Air conditioning devices with or without control louvers, for pressure or air flow control, with elastic joints or suction duct.

- **Filtering unit**
  Air conditioning device with filter inserts in accordance with DIN 24185. Filter class according to EN 779: G1-G2, G3-G4, F5-F9 and H10-H14. Panelling, bag, compact, HEPA filters.

- **Heating unit**
  Heat exchanger for hot water, a mixture of glycol, steam or freon. Electric heater with elements of control and protection.

- **Refrigeration unit**
  Heat exchanger for cold water, a mixture of glycol, steam or direct freon expansion. Pan for accumulation of condensate at the bottom of the unit. Drops eliminator from PVC and stainless steel frame.

- **Fan unit**
  High performance radial double-suction fans, electric motor and V-belt transmission, IP protection class 55. Centrifugal fans without housing directly powered by electric motor. Stand with anti-vibration inserts.

- **Humidification unit**
  Steam humidifier with electric steam generator or central steam preparation.

- **Unit with heat recovery device**
  KV fin recovery device with two heat exchangers.

- **Sound attenuator**
  Acoustic backdrop fillings, fireproof, A2 class according to DIN 4102, coated with wear resistant material.

STANDARDS AND GUIDELINES

- BS EN 1886:2003 - Ventilation in buildings - the Central air treatment units - Specifications (EN 1886: 1998)
- HRN EN 13053:2004 – Ventilation in buildings - the Central air treatment units - Division and unit, parts and section features (EN 13053:2001+AC:2002)
- VDI 3803 - Basic technical requirements for ventilation and air conditioning systems
- VDI 6022 Part 1 - Hygiene requirements for design, installation, operation and maintenance of ventilation systems - Offices and common spaces
- VDI 6022 Part 3 - Hygiene requirements for design, installation, operation and maintenance of ventilation systems in manufacturing plants
- DIN 1946, Part 2 - Health requirements for ventilation and air conditioning systems
- DIN 1946 Part 4 - Ventilation and air-conditioning systems in hospitals

MECHANICAL INSTALLATIONS

HVAC installations

SPECIFICATIONS

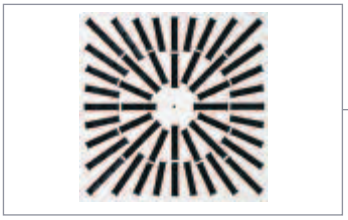
- Anodized aluminium or steel grilles
- Grilles with adjustable, fixed or opaque blades, with/without dampers
- Anodized aluminium or steel diffusers
- Diffusers with adjustable, fixed or opaque blades, swirl, perforated, variable swirl, slot diffusers, with horizontal or vertical air discharge, with individually adjustable blades, with/without dampers, with/without plenum box
- Grilles and diffusers for various heights, air flow direction adjustment, plastic coated in standard RAL 9010 white colour, other colours upon request
- Special diffusers: jet nozzles, air valves, staircase swirl diffusers, air displacement diffusers, floor diffusers
- Louvres and dampers of galvanized steel sheet, aluminium sheet or extruded aluminium profiles, with/without sub-frame
- Variable and constant air volume control dampers, cylindrical or rectangular, factory setting according to requirements, without maintenance, motorized or manually operation, pressure regulators
- Sound attenuators with aerodynamically designed attenuation splitter, splitter from non-fire, absorbent material – rockwool, in accordance with the class A2 according to HRN and DIN 4102, Part 1. Hygiene requirements are met in accordance with VDI 6022, Part 1 and Part 3, DIN 1946, Part 2 and Part 4, VDI 3803
- Fire dampers, cylindrical or rectangular, motorized or manually operated with fusible link, tested according to HRN EN 1366-2 on 300 Pa, classified according to HRN EN 13501-3
- Option: **Systems in Ex design**

DESIGN REQUIREMENTS

- The air in the room should be clean - no smell, dust and other impurities
- Temperature and relative humidity indoors should satisfy the conditions according to purpose and activities in the space
- Total supply air stream must contain a hygienic prescribed minimum share of fresh outdoor air

PRODUCTION PROGRAM

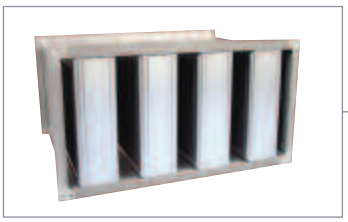
VENTILATION GRILLES



CEILING DIFFUSERS

SPECIAL DIFFUSERS

AIR REGULATION



SOUND ATTENUATORS

FIRE AND SMOKE DAMPERS

AUTOMATION

BMS (Building Management System)

SPECIFICATION

- Automation in cleanrooms and buildings
- Control and supervision of mechanical and electrical equipment: ventilation, lighting, power systems, fire systems, safety systems, etc.
- Internet protocols: DeviceNet, BACnet, LONWORKS, Modbus
- When configured properly, achieve significant energy savings
- Recording of all incidents in accordance with GMP guidelines

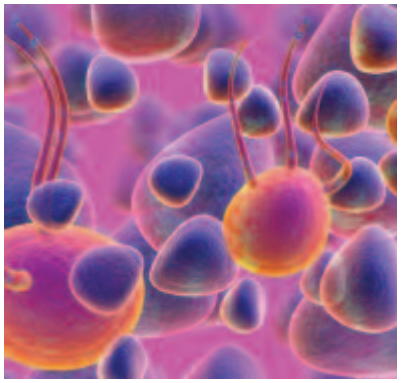
BENEFITS

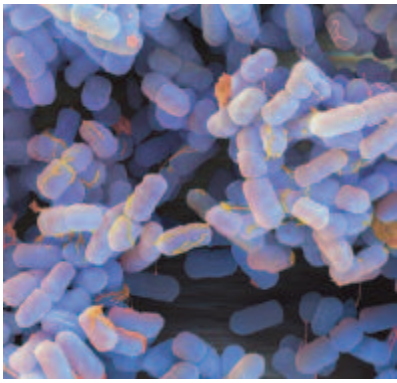
- Internal comfort conditions control
- Possibility of individual control
- Increased staff productivity
- Effective monitoring of energy consumption
- Increased plant reliability
- Maintenance savings
- HVAC system control (air-handling units, fire dampers, VAV and CAV systems, sound attenuators)
- Central or remote control
- Simple, safe and fast detection of problems

REGULATION AND SUPERVISION OF PARAMETERS

- Lighting
- Temperature, rel. humidity
- Electricity
- Pressure profile
- Air flow
- Interlock systems management
- HVAC system for preparation of energy
- Security and surveillance
- Access control
- Fire alarm system
- Elevators, lifts
- Other systems requiring continuous monitoring

AIR FILTRATION



Ambient air, both outdoor and indoor, is subject to contamination of solid or liquid particles of mineral or organic origin which are called aerosols. The size of these particles varies from 0.0001 µm to 100 µm. Particles larger than 10 µm are regularly deposited on the ground, while particles smaller than 1 µm, and especially those smaller than 0.3 µm, remain floating in the air. The average concentration of these particles in the atmosphere over the European continent is measured in millions per 1 liter of air, and they are divided into the categories below:

- Dust - small solid particles
- Smoke - tiny solid particles
- Fog - tiny droplets
- Haze - very small droplets
- Steam - gaseous substance

Those particles are caused by:

- Natural processes occuring on Earth's surface
- Vegetation on Earth
- Organisms inhabiting the Earth, including human beings
- Man-made technological processes

Absolute filtes[1] reduced this concentration to 3.5 particles per 1 liter of air, even less. In addition to dust, the environmental and ambient air contains live microorganisms, microbes, ferments, fungi, bacteria, viruses, etc. The air purged from living organisms is called sterile. Such air can be obtained only by using absolute filters.
The experiences of some researchers suggest that there is a relationship between the number of live particles and the number of inert (organic and inorganic) particles and this relationship varies from 1: 500 to 1: 12000, while most often it is 1:1000.

Once the air passes through the absolute filter it becomes clean and almost sterile. If an even greater security is required in respect to sterility, then beyond the absolute filter UV lamps which kill any remaining microorganisms that could not be stopped by the absolute filter are mounted.

[1] More loose expression for suspended particles filter, because of their very high efficiency.

Classification of filters according to standards

The main factor in air filtration are filtering materials i.e. filter cartridges or, shorter, filters: coarse, fine and absolute (filters for flying particles). Coarse, fine and absolute filters built into the final product (box or tin case) regularly get extended names eg.

- Air filter
- Duct filter
- Ceiling diffuser with absolute filter

Filter, as a final product consists of one, two or three of the filter cartridges, the last one built in the series is called filter, and the previous ones are called pre-filters.

In 1993. European Committee for Standardization, Technical Committee 195, Working Group 1 (CEN/TC195 WG1) issued new norms for coarse and fine filters for general ventilation. The introduction of this standard, called EN 779, requires that European Union member states issue their own national version of those norms within set workframe (eg. BS EN 779 in the UK, DIN EN 779 in Germany). Standard EN 779 is based on existing documents, such as EUROVENT 4/5 and ASHRAE 52.1 1992, but it is actually much stringent than those documents.
It also includes a new classification system for coarse and fine filters, based on the average efficiency of dust extraction in particular final pressure drop. Filters with an initial efficiency degree of Eo < 20% were classified as coarse filters in the G1-G4 range. The final pressure drop in certification is determined by ≤ 250 Pa. Filters with an initial degree of efficiency Eo ≥ 20% are classified as filters in the E5-F9 range. The final pressure drop in certification is determined by ≤ 450 Pa.

CLASSIFICATION OF AIR FILTERS ACCORDING TO DIFFERENT STANDARDS

	StF	DIN 24185, part 100	DIN 24185, part 2			EN 779
COARSE	A	A	EU 1	Am < 65	-	G1
	B	B_1	EU 2	65 ≤ Am ≤ 80	-	G2
		B_2	EU 3	80 ≤ Am ≤ 90	-	G3
			EU 4	90 ≤ Am	-	G4
FINE	C	C_1	EU 5	-	40 ≤ Em ≤ 60	M5
			EU 6	-	60 ≤ Em ≤ 80	M6
		C_2	EU 7	-	80 ≤ Em ≤ 90	F7
		C_3	EU 8	-	90 ≤ Em ≤ 95	F8
			EU 9	-	95 ≤ Em	F9

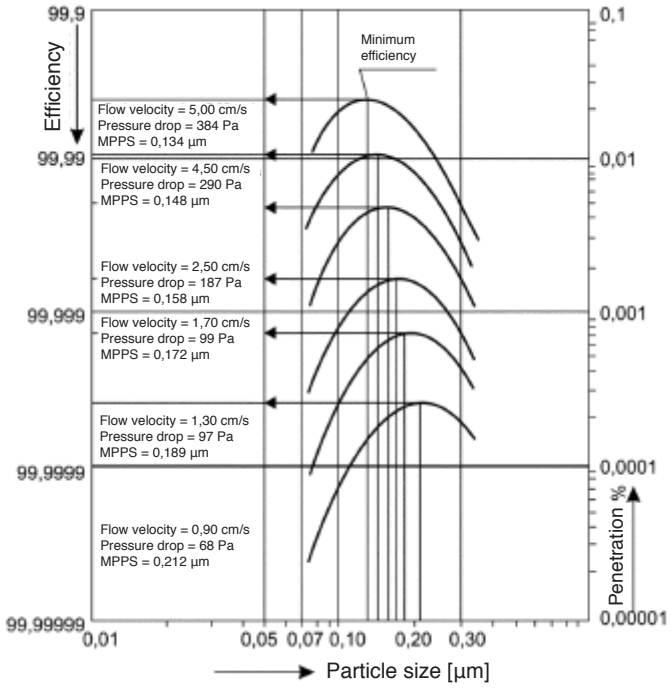
	StF	DIN 24185, part 100	DIN 24185, T1, E, Appendix A		E % 0,3 µm	E % MPPS	EN 1822	
HEPA	Filters for flying particles	Q	EU 10	1	> 95	-	E10	3
		R	EU 11		> 98	-	E11	
		S	EU 12		> 99,99	-	E12	
			EU 13		> 99,997	-	H13	
			EU 14		> 99,999	-	H14	
ULPA					-	**E % 0,12 µm**		
			EU 15	2	-	> 99,9995	U15	4
			EU 16		-	> 99,99995	U16	
			EU 17		-	> 99,999995	U17	

KEY

Mark	Explanation
1	Typical absolute filters
2	High-efficiency absolute filters
3	High-efficiency filters for suspended particles (HEPA)
4	Filters for suspended particules with ultra-low passing (ULPA)
StF	Institute for Dust Research of Asocition of Craft expert groups in Bonn, Germany
DIN 24185, part 100 **DIN 24185, part 2**	Conforms to European EUROVENT classification
EUROVENT	European Committee of technical air and drying system manufacturers in Frankfurt, Germany.
EN 779 **EN 1822**	European Standards
Am	Average separation degree funding for **COARSE** filter (compared to artificial dust)
Em	Average efficiency for **FINE** filters (compared to artificial dust)
E %	Medium (minimum) efficiency for **HEPA** and **ULPA** filters
MPPS	Particle sizes that pass through the filter (Most Penetrating Particle Size)
HEPA	High-efficiency filter for suspended particles (High Efficiency Particulate Air Filter)
ULPA	Ultra low-pass filter for suspended particles (Ultra Low Penetration Air Filter). This group includes absolute filters with commercial names VHSI, MEGA, MEGA SUPER etc.

Filter performances

- Glass fiber filters in a roll
- Synthetic fiber filters in a roll
- Synthetic fibers filters resistant to a temperature up to 200°C
- Synthetic fibers filters for paint shops
- Paper filter
- Bag synthetic fiber filters
- Bag filters from synthetic and glass fibers
- Combustible bag filters
- Washable metal filters
- Compact high-capacity filters
- Absolute HEPA and ULPA filters
- Absolute cleanroom and operating room filters
- Filters resitant to high temperatures (up to 480°C)
- Activated carbon filters
- Filters with automatic drive in roll
- Dusting filters
- Electrostatic filters



PASSING OF PARTICLES IN CERTAIN SIZE (ACCORDING TO CEN TC/WG2 NO22 DRAFT)

In addition to efficiency of the absolute filter, which is defined by class range E10-U17, the user may find important the information about the largest particle size, penetrating through filter media in certain air velocity. Tests described below are conducted for that purpose.

The size particles most penetrating throught filtration media (MPPS), is determined for the given air velocity (direction flow is perpendicular to the filter surface).

Aerosol and MPPS particles stream through the filter. Local and overall efficiency is defined by particle counter (CNC) or laser spectoometer.

The filter is classified in accordance tests results to classes E10-H14 for HEPA or U15-U17 for ULPA filters. Penetration is defined as the maximum allowed local penetration of MPPS times expressed in percentages which must not exceed five times of total penetration.

Filter Class	Efficacy relative to MPPS		Penetration compared to MPPS	
	Total	Local	Total	Local
E10	≥ 85	-	15	-
E11	≥ 95	-	5	-
E12	≥ 99,5	97,5	0,5	2,5
H13	≥ 99,95	99,75	0,05	0,25
H14	≥ 99,995	99,975	0,005	0,025
U15	≥ 99,9995	99,9975	0,0005	0,0025
U16	≥ 99,99995	99,99975	0,00005	0,00025
U17	≥ 99,999995	99,999975	0,000005	0,0001

NOTE:

- For E10 and E11 filter classes the certificate on local penetration is not necessary
- Filters in E12, H13 and H14 classes may be tested with a mist test, in accordance with EN 1822 which is generally accepted and more known than the said local penetration
- Filter class U17 is an exception to the rule; in this case the value of local leakage expressed as a percentage, must not be greater than the value of total ten times penetration value

Approximate data on coarse and fine filters

Coarse filters for spatial filtering commonly used in air-conditioning of manufacturing plants, compressor stations, protection of electrical equipment and as prefilters in more demanding air-handling units (paint shops, office buildings...).

Fine filters for spatial filtering are present in hospitals, laboratories, power plants, paint shops and elsewhere.

Absolute filters are commonly used in operating rooms, medical and pharmaceutical industry, sterile fillers, microtechnology plants and microelectronics, food industry and other facilities where it is necessary to meet the highest air purity requirements.

COARSE FILTERS

Class	G1*	G2*	G3*	G4*
Recommended velocity flow m/s	2,5	2,0	2,0	2,0
Unit capacity $m^3/h\ m^2$	9000	7200	7200	7200
Initial resistance Pa	40	40	45	60
Recommended final resistance Pa	100-200	150-200	160-200	160-200
Average spending Am%	do 100	75-80	80-85	87-92
Allowed operatin temperature °C	-30 do 120	do 100	do 100	do 100
Thickness mm	10÷20	13÷25	15÷20	20

*Levels filter cartridge, in roll or sewn in the bag forms

FINE FILTERS

Class	M5**	M6**	F7**	F8**	F9**
Recommended velocity flow m/s	0,9	2,5	2,0	2,5	3,5
Unit capacity $m^3/h\ m^2$	3240	9000	7200	7200	12600
Initial resistance Pa	90	80	100	120	120-140
Recommended final resistance Pa	200-400	250	350	350	450
Average efficiency Em%	40÷50	60÷80	80÷90	90÷95	more than 95
Allowed operatin temperature °C	to 100	-30 to +90	-30 to +90	-30 to +90	-30 to +90
Thickness mm	20	100	78	100	292

**Pleated filter cartridge, embedded in different frames

The classification of different classes of cleanliness according to ISO 14644-1, U.S.F.S. 209 E and EU GMP guidelines

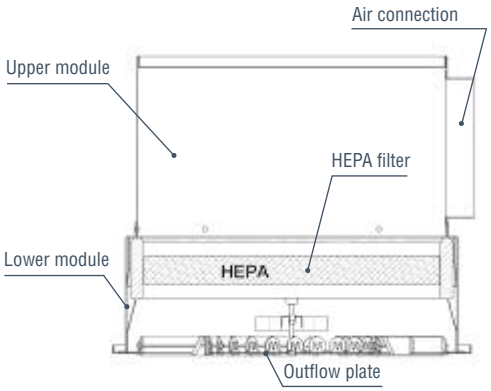
Cleanliness class according to ISO 14644-1 standard		8	7	6	5	4	3
Cleanliness classes according to US Federal Standard 209 E		100 000	10 000	1 000	100	10	1
Purity classes by EU GMP standard		D	C	B	A		
Maximum permitted number of particles (particle/m^3) is equal to or greater than	5.0 µm	29 300	2 930	293	29	-	-
	1.0 µm	832 000	83 200	8 320	832	83	8
	0.5 µm	3 520 000	352 000	35 200	3 520	352	35
	0.3 µm	-	-	102 000	10 200	1 020	102
	0.2 µm	-	-	237 000	23 700	2 370	237
	0.1 µm	-	-	1 000 000	100 000	10 000	1 000
Type of flow		turbulent	turbulent	transition	unidirectional	unidirectional	unidirectional
Maximum number of air changes i/h		36-90	60-100	180-300	300-480	420-600	500-640
Minimum flow velocity m/s		0.08-0.10	0.10-0.15	0.15-0.25	0.26-0.36	0.36-0.41	0.38-0.46
Minimum coverage of ceiling with filters%		15	30	40	75	100	100
Filter Type		H12	H12	H13	H14	U16	U16
Air intake outlets		Ceiling swirl diffusers	Ceiling swirl diffusers	Filtering outlet ceiling	Filtering outlet ceiling	Filtering outlet ceiling	Filtering outlet ceiling
Exhaust air outlets		Side wall	Low set side wall	Low set side wall	Floor or low set side	Floor	Floor
Cleanroom excess pressure		10-15	10-15	10-15	10-15	1.5	1.5
Temperature °C		22°C±1°C, not more than 2°C during 4 hour variation	22°C±1°C, not more than 2°C during 4 hour variation	22°C±1°C, not more than 2°C during 4 hour variation	22°C±0.5°C, not more than 1°C during 4 hour variation	22°C±0.25°C, not more than 0.5°C during 4 hour variation	22°C±0.25°C, not more than 0.5°C during 4 hour variation
Humidity%		45%RH±5% not more than 5% during 4 hour variation	45%RH±5% not more than 5% during 4 hour variation	45%RH±5% not more than 5% during 4 hour variation	45%RH±5% not more than 3% during 4 hour variation	45%RH±5% not more than 3% during 4 hour variation	45%RH±5% not more than 3% during 4 hour variation
Particles counting		12 months	12 months	12 months	6 months	6 months	6 months
Volumetric flow or airstream velocity		12 months	12 months	12 months	12 months	12 months	12 months
Integrity of filters and housings		24 months	24 months	24 months	24 months	24 months	24 months
Flow visualization		24 months	24 months	24 months	24 months	24 months	24 months

Absolute ceiling filter FAC

SPECIFICATION

- Absolute ceiling filter with diffuser plate is intended for the supply of highly filtered air in Class 7 and 8 according to ISO 14644 standard (laboratories, operating rooms, intensive care rooms)
- The housing consists of an upper module with air connector and lower module with absolute filter in Class E10; E11; E12, H13 or H14 to EN 1822. Moduls from stainless steel
- Airtight moduls
- Connector for filter and housing permeability control at the top module, connector for DOP test
- Upon request, filter filling control connector
- Diffuser plate made of steel, laminated in RAL 9010 white colour, other colours or design from stainless steel upon request
- External dimensions of diffuser plate factory fit to plenum box dimensions
- Filter replacement from lower (clean) housing side, after removal of the diffuser plate

FAC - COMPONENTS



CONNECTOR FOR AIR DUCT TO THE HOUSING

- Horizontal cylindrical connector FAC-HO
- Vertical cylindrical connector FAC-V
- Horizontal rectangular connector FAC-H
- Horizontal rectangular connector with airtight damper, manual mode. Optional motor driven FAC-HZ

ACCESSORIES

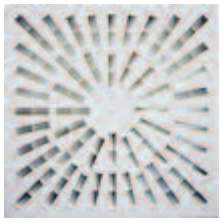
- Connector for DOP test for panel mounting (wall or ceiling)
- Connector for pressure control of filters filling for panel mounting (wall or ceiling)
- Differential pressure gauge (0-500 Pa)

DIFFUSER PLATES


ANK


ANP


DEK-K


DEU


DEV-K

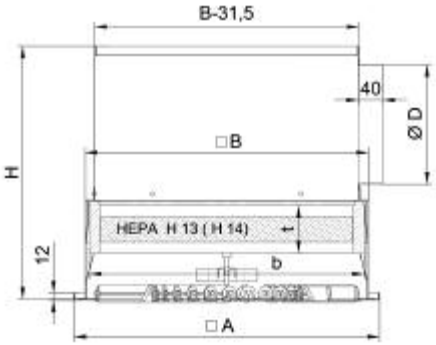

DVS-K

DIFFUSER PLATES DIMENSIONS

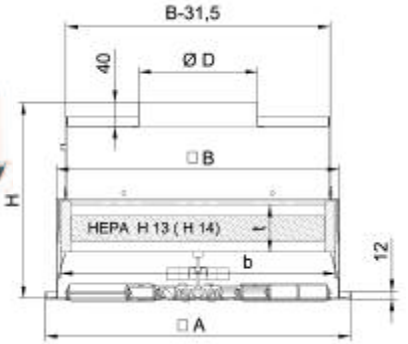
For: FAC-HO, FAC-V, FAC-H, FAC-HZ	ANEMOSTATS						
FAC		DEV-K	DEK-K	DEU	ANK	ANP	DVS-K
	319 x H	DEV-K 355/12	DEK-K 355	DEU 355	ANK 3 (CR) 358	ANP 355	-
	471 x H	DEV-K 510/24	DEK-K 510	DEU 510	ANK 6 (CR) 500	ANP 510	DVS-K 510
	549 x H	DEV-K 580/24	DEK-K 580	DEU 580	ANK 580 (CR)	ANP 580	DVS-K 580
	589 x H	DEV-K 625/54	DEK-K 625	DEU 625	ANK 8 (CR) 625	ANP 625	DVS-K 625
	624 x H	DEV-K 660/54	DEK-K 660	DEU 660	ANK 660 (CR)	ANP 660	DVS-K 660

For: FAC-HO, FAC-V, FAC-H, FAC-HZ	ANEMOSTATS Effective surfaces (m^2)						
FAC		DEV-K	DEK-K	DEU	ANK	ANP	DVS-K
	319 x H	0,0149 m^2	0,0150 m^2	0,0192 m^2	0,0295 m^2	0,0380 m^2	-
	471 x H	0,0298 m^2	0,0376 m^2	0,0517 m^2	0,0728 m^2	0,0836 m^2	0,0180 m^2
	549 x H	0,0436m^2	0,0408 m^2	0,0517 m^2	0,1080 m^2	0,1117 m^2	0,0295 m^2
	589 x H	0,0671 m^2	0,0616 m^2	0,0718 m^2	0,1280 m^2	0,1117 m^2	0,0295 m^2
	624 x H	0,0671 m^2	0,0616 m^2	0,0718 m^2	0,1440 m^2	0,1451 m^2	0,0295 m^2

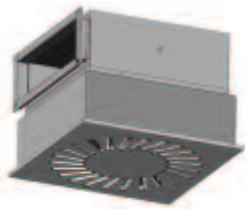
TECHICAL DATA

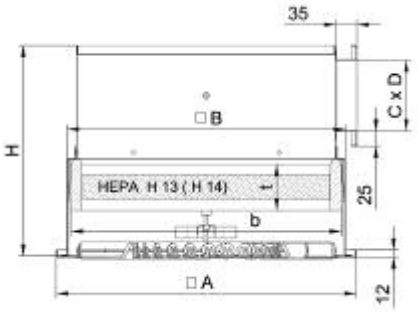


	Nominal dimensions FAC-HO	Dimensions FAC-HO B (mm)	H (mm)	ΦD (mm)	A (mm)	Absolute filter dimensions b x h x t			Q_{max} (H13) m³/h	Δp_p (H13) Pa	Q_{max} (H14) m³/h	Δp_p (H14) Pa	Δp_k Pa
FAC-HO	319 x 380	319	380	158	355	305	305	78	250	175	250	220	400
	471 x 470	471	470	248	510	457	457	78	570	175	570	220	400
	549 x 470	549	470	248	580	535	535	78	770	175	770	220	400
	589 x 520	589	535	313	625	575	575	78	890	175	890	220	400
	624 x 535	624	535	313	660	610	610	78	1000	175	1000	220	400

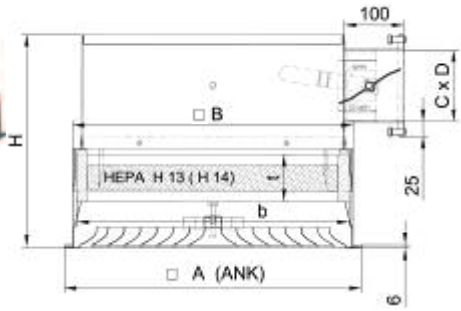


	Nominal dimensions FAC-V	Dimensions FAC-V B (mm)	H (mm)	ΦD (mm)	A (mm)	Absolute filter dimensions b x h x t			Q_{max} (H13) m³/h	Δp_p (H13) Pa	Q_{max} (H14) m³/h	Δp_p (H14) Pa	Δp_k Pa
FAC-V	319 x 328	319	328	158	355	305	305	78	250	175	250	220	400
	471 x 328	471	328	248	510	457	457	78	570	175	570	220	400
	549 x 328	549	328	248	580	535	535	78	770	175	770	220	400
	589 x 328	589	328	313	625	575	575	78	890	175	890	220	400
	624 x 328	624	328	313	660	610	610	78	1000	175	1000	220	400





	Nominal dimensions FAC-H	Dimensions FAC-H B (mm)	H (mm)	C (mm)	D (mm)	A (mm)	Absolute filter dimensions b x h x t			Q_{max} (H13) m³/h	Δp_p (H13) Pa	Q_{max} (H14) m³/h	Δp_p (H14) Pa	Δp_k Pa
FAC-H	319 x 360	319	360	250	120	355	305	305	78	250	175	250	220	400
	471 x 360	471	360	400	120	510	457	457	78	570	175	570	220	400
	549 x 360	549	360	475	120	580	535	535	78	770	175	770	220	400
	589 x 360	589	360	520	120	625	575	575	78	890	175	890	220	400
	624 x 360	624	360	550	120	660	610	610	78	1000	175	1000	220	400



	Nominal dimensions FAC-HZ	Dimensions FAC-HZ B (mm)	H (mm)	C (mm)	D (mm)	A (mm)	Absolute filter dimensions b x h x t			Q_{max} (H13) m³/h	Δp_p (H13) Pa	Q_{max} (H14) m³/h	Δp_p (H14) Pa	Δp_k Pa
FAC-HZ	319 x 360	319	360	250	120	355	305	305	78	250	175	250	220	400
	471 x 360	471	360	400	120	510	457	457	78	570	175	570	220	400
	549 x 360	549	360	475	120	580	535	535	78	770	175	770	220	400
	589 x 360	589	360	520	120	625	575	575	78	890	175	890	220	400
	624 x 360	624	360	550	120	660	610	610	78	1000	175	1000	220	400

KEY

B [mm]	Nominal dimensions of the FAC (width)
H [mm]	FAC height
ΦD [mm]	Cylindrical connector diameter
A [mm]	Diffuser plate dimensions
b [mm]	Absolute filter width
h [mm]	Absolute filter length

t [mm]	Absolute filter depth
C [mm]	Rectangular connector length
D [mm]	Rectangular connector height
Q_{max} [m³/h]	Air flow (maximum)
Δp_p [Pa]	Pressure drop on the filter initial
Δp_k [Pa]	Pressure drop on the filter end

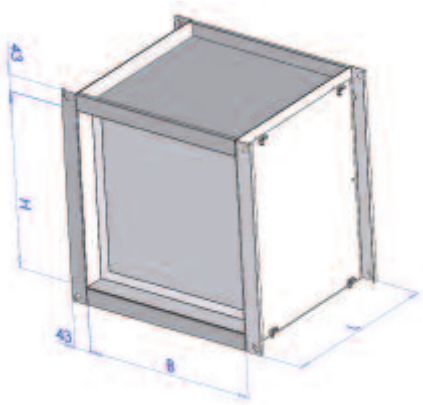
OP: Ordering marks, see page 41.

Absolute duct filter FAK

SPECIFICATION

- Absolute duct filter designed for absolute air filtration before the premises in which the high class air quality is required (pharmaceutical, food, electronic industry, hospitals)
- The filter cartridge is an absolute HEPA filter H13 or H14 class for floating particles of 0.3 µm efficiency of 99.95 ÷ 99.995% according to EN 1822
- Connectors for control of filter filling on housing
- Housing made of stainless steel, laminated in white RAL 9010, other colours available on request
- Filter replacement from the side of the housing, after removing the cover

FAK - DIMENSIONS



TECHICAL DATA

	Nominal dimensions Absolute duct filter FAK	FAK dimensions B (mm)	H (mm)	L (mm)	Absolute filter dimensions b x h x t			Q_{max} m³/h	Δp_p (H13) Pa	Δp_p (H14) Pa	Δp_k Pa
FAK	309 x 309 x 450	309	309	450	305	305	78	250	250	280	500
	461 x 461 x 450	461	461	450	457	457	78	570	250	280	500
	309 x 614 x 450	309	614	450	305	610	78	500	250	280	500
	614 x614 x 450	614	614	450	610	610	78	1000	250	280	500
	309 x 309 x 600	309	309	600	305	305	292	500	250	280	500
	461 x 461 x 600	461	461	600	457	457	292	1140	250	280	500
	309 x 614 x 600	309	614	600	305	610	292	1000	250	280	500
	614 x 614 x 600	614	614	600	610	610	292	2000	250	280	500
	309 x 614 x 600 -max	309	614	600	305	610	292	1500	250	280	500
	614 x 614 x 600 -max	614	614	600	610	610	292	3400	250	280	500

Other dimensions enabled on request.

MARKS	
Q_{max}	Maximum air flow
Δp_p (H13)	Initial pressure drop on the filter for H13 Class
Δp_p (H14)	Initial pressure drop on the filter for H14 Class
Δp_k	Final pressure drop on the filter (backfilled filter)
B, b	Width
H, h	Height
L	Length
t	Depth

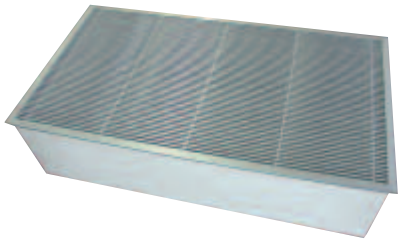
OP: Ordering marks, see page 41.

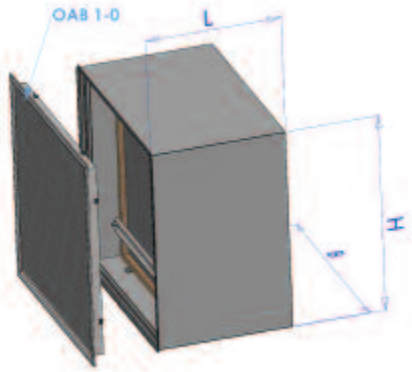
Absolute duct filter with grille FAR

SPECIFICATION

- Absolute duct filter with grille designed for the supply of highly filtered air in the cleanroom (microbiological labs, operating rooms, intensive care rooms, pharmaceutical, food, electronics industry)
- The filter cartridge is an absolute HEPA filter H13 or H14 class for floating particles of 0.3 µm efficiency of 99.95 ÷ 99.995% according to EN 1822
- Aluminum grille of extruded Al-profiles, protected by anodic oxidation (anodization) in natural aluminum color
- Housing made of stainless steel, laminated in white RAL 9010, other colours available on request
- Installation at the ventilation duct end
- Filter replacement from the clean side i.e. grille side

FAR - DIMENSIONS





TECHICAL DATA

Nominal dimensions Absolute duct filter FAR		FAR dimensions B (mm)	H (mm)	L (mm)	Absolute filter dimensions b x h x t			Q_{max} m³/h	Δp_p (H13) Pa	Δp_p (H14) Pa	Δp_k Pa
FAR	309 x 309 x 450	309	309	450	305	305	78	250	250	280	500
	461 x 461 x 450	461	461	450	457	457	78	570	250	280	500
	309 x 614 x 450	309	614	450	305	610	78	500	250	280	500
	614 x614 x 450	614	614	450	610	610	78	1000	250	280	500
	309 x 309 x 600	309	309	600	305	305	292	500	250	280	500
	461 x 461 x 600	461	461	600	457	457	292	1140	250	280	500
	309 x 614 x 600	309	614	600	305	610	292	1000	250	280	500
	614 x 614 x 600	614	614	600	610	610	292	2000	250	280	500
	309 x 614 x 600 -max	309	614	600	305	610	292	1500	250	280	500
	614 x 614 x 600 -max	614	614	600	610	610	292	3400	250	280	500

Other dimensions enabled on request.

MARKS	
Q_{max}	Maximum air flow
Δp_p (H13)	Initial pressure drop on the filter for H13 Class
Δp_p (H14)	Initial pressure drop on the filter for H14 Class
Δp_k	Final pressure drop on the filter (backfilled filter)
B, b	Width
H, h	Height
L	Length
t	Depth

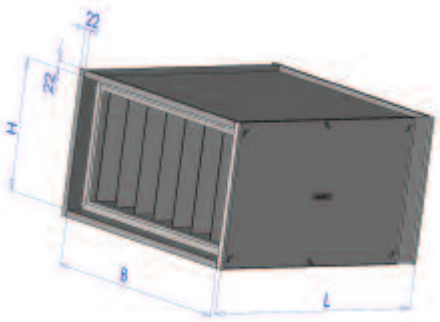
OP: Ordering marks, see page 41.

Bag duct filter FKV-P

SPECIFICATION

- Bag duct filter for rectangular ducts is designed for air filtration in air-conditioning systems that require higher air purity (laboratories, pharmaceutical, food processing and electronics industry, hospitals)
- Installation of bag duct filters extends duration of HEPA filters, larger particles are removed by bag filter built-in before HEPA filter
- Housing made of galvanized steel sheet, laminated steel sheet design in the desired RAL colour or completely from stainless steel available on request
- Bag filter M5 class to F7, according to EN 779, installed in the housing
- Filter replacement from the side of the housing, after removing the cover. For larger dimensions (B>18 mm) two covers are installed on two sides for easy filter changes

FKV-P - DIMENSIONS



TECHICAL DATA

Nominal dimensions Bag duct filter FKV-P (for rectangular duct)		FKV-P dimensions			Bag filters dimensions b x h x 630 (1; 2; 3; 4; 6 the number filter)			Q_{max} m^3 / h	Δp_p (M5) Pa	Δp_p (M6) Pa	Δp_p (F7) Pa	Δp_p (F8) Pa	Δp_p (F9) Pa	Δp_k Pa
		B (mm)	H (mm)	L (mm)	592 x 592	287 x 592	287 x 287							
FKV-P	613 x 613 x 750	613	613	750	1	0	0	3 400	60	68	83	86	86	450
	918 x 613 x 750	918	613	750	1	1	0	5 100	60	68	83	86	86	450
	1223 x 613 x 750	1223	613	750	2	0	0	6 800	60	68	83	86	86	450
	1528 x 613 x 750	1528	613	750	2	1	0	8 500	60	68	83	86	86	450
	1833 x 613 x 750	1833	613	750	3	0	0	10 200	60	68	83	86	86	450
	613 x 918 x 750	613	918	750	1	1	0	5 100	60	68	83	86	86	450
	918 x 918 x 750	918	918	750	1	2	1	7 650	60	68	83	86	86	450
	1223 x 918 x 750	1223	918	750	2	2	0	10 200	60	68	83	86	86	450
	1528 x 918 x 750	1528	918	750	2	2	1	12 750	60	68	83	86	86	450
	1833 x 918 x 750	1833	918	750	3	3	0	15 300	60	68	83	86	86	450
	613 x 1223 x 750	613	1223	750	2	0	0	6 800	60	68	83	86	86	450
	918 x 1223 x 750	918	1223	750	2	1	0	10 200	60	68	83	86	86	450
	1223 x 1223 x 750	1223	1223	750	4	0	0	13 600	60	68	83	86	86	450
	1528 x 1223 x 750	1528	1223	750	4	2	0	17 000	60	68	83	86	86	450
	1833 x 1223 x 750	1833	1223	750	6	0	0	20 400	60	68	83	86	86	450

Other dimensions enabled on request.

MARKS	
Q_{max}	Maximum air flow
Δp_p (M5)	Initial pressure drop on the filter for M5 class
Δp_p (M6)	Initial pressure drop on the filter for M6 class
Δp_p (F7)	Initial pressure drop on the filter for F7 class
Δp_p (F8)	Initial pressure drop on the filter for F8 class
Δp_p (F9)	Initial pressure drop on the filter for F9 class
Δp_k	Final pressure drop on the filter (backfilled filter)
B, b	Width
H, h	Height
L	Length

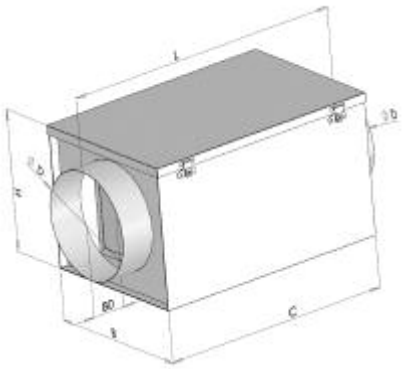
OP: Ordering marks, see page 41.

Bag duct filter FKV-C

SPECIFICATION

- Bag duct filter for cylindrical ducts is designed for air filtration in air-conditioning systems that require higher air purity (laboratories, pharmaceutical, food processing and electronics industry, hospitals)
- Installation of bag duct filters extends duration of HEPA filters, heaters, coolers and similar elements, larger particles are removed by bag filter built-in before HEPA filter
- Housing made of galvanized steel sheet, laminated steel sheet design in the desired RAL colour or completely from stainless steel available on request
- Bag filter M5 class to F7, according to EN 779, installed in the housing
- Filter replacement from the top or bottom side of the housing, after removing the cover

FKV-C - DIMENSIONS



TECHICAL DATA

Nominal dimensions bag duct filter FKV-C (for cylindrical duct)		FKV-C dimesions					Bag filters dimensions b x h x d			Q_{max} m^3 / h	Δp_p (M5) Pa	Δp_p (M6) Pa	Δp_p (F7) Pa	Δp_p (F8) Pa	Δp_p (F9) Pa	Δp_k Pa
		Ø (mm)	B (mm)	H (mm)	C (mm)	L (mm)	b	h	d							
FKV-C	100	98	210	170	430	528	204	155	260	200	60	68	83	86	86	450
	125	123	210	170	430	534	214	190	260	320	60	68	83	86	86	450
	160	158	270	235	450	554	264	220	260	500	60	68	83	86	86	450
	200	198	320	245	500	620	312	260	260	720	60	68	83	86	86	450
	250	248	370	325	560	680	362	310	360	1100	60	68	83	86	86	450
	315	313	430	395	625	745	423	372	360	1500	60	68	83	86	86	450
	355	353	520	496	635	765	512	480	360	2100	60	68	83	86	86	450
	400	398	520	496	635	765	512	480	360	2400	60	68	83	86	86	450
	500	498	620	596	635	765	612	580	360	3600	60	68	83	86	86	450

Other dimensions enabled on request.

MARKS	
Ø	Diameter
B, b	Width
H, h	Height
C	Connection
L	Length
d	Depth
Q_{max}	Maximum air flow
Δp_p (M5)	Initial pressure drop on the filter for M5 class
Δp_p (M6)	Initial pressure drop on the filter for M6 class
Δp_p (F7)	Initial pressure drop on the filter for F7 class
Δp_p (F8)	Initial pressure drop on the filter for F8 class
Δp_p (F9)	Initial pressure drop on the filter for F9 class
Δp_k	Final pressure drop on the filter (backfilled filter)

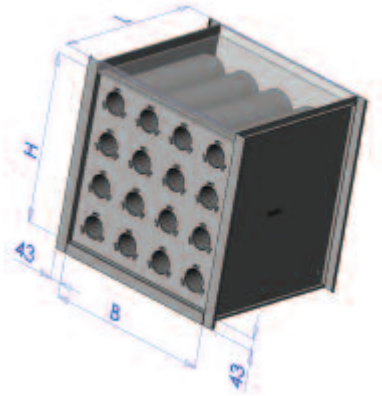
OP: Ordering marks, see page 41.

Absolute filter with active coal FKU

SPECIFICATION

- Duct filter with active coal designed for air filtration and removal of odors from the kitchen, public buildings, offices and industrial plants
- Optional: filter with active coal for absorption of gases (chemicals) in the pharmaceutical and chemical industries, refineries
- Housing made of galvanized steel sheet, laminated steel sheet design in the desired RAL colour or completely from stainless steel available on request
- Gasket in the housing to which filter with active coal is attached
- Filter replacement from the housing side, after removing the cover
- Maximum continuous operating temperature of 50°C
- Maximum relative humidity 70%

FKU - DIMENSIONS



TECHICAL DATA

Nominal FKU dimensions		FKU dimensions			Number of cylindrical cartriges with activated coal	Q_{max}	Q_{nom}	Pressure drop for Q_{nom}/ Q_{max} Δp (Pa) Δp= const
		B (mm)	H (mm)	L (mm)				
FKU	309 x 309 x 600	309	309	600	4	840	660	200/280
	380 x 380 x 600	380	380	600	5	1050	825	200/280
	464 x 309 x 600	464	309	600	6	1260	990	200/280
	309 x 614 x 600	309	614	600	8	1680	1320	200/280
	760 x 309 x 600	760	309	600	10	2100	1650	200/280
	614 x 614 x 600	614	614	600	16	3360	2640	200/280
	910 x 1060 x 600	910	1060	600	42	8820	6930	200/280

Other dimensions enabled on request.

MARKS	
B	Width
H	Hight
L	Lenght
Q_{max}	Maximum air flow
Q_{nom}	Nominal air flow
Δp	Pressure drop

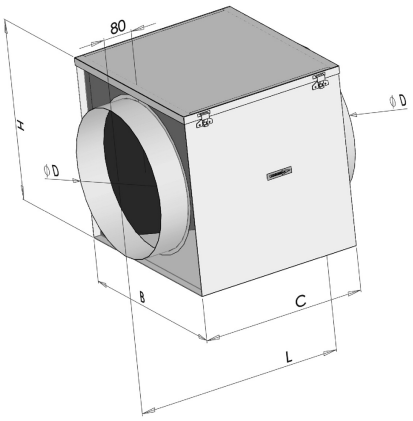
OP: Ordering marks, see page 41.

Duct filter FKK

SPECIFICATION

- Duct filter for cylindrical ducts is designed for air filtration in air-conditioning systems that require pre-filter installation due to protection of the elements inside the ventilation system
- Installation of bag filter prolongs the life of the HEPA filters, heaters, coolers and similar items
- Housing made of galvanized steel sheet, laminated steel sheet design in the desired RAL colour or completely from stainless steel available on request
- Filter replacement from the upper side of the housing, after removing the cover
- Filter replacement from the upper side of the housing, after removing the cover

FKK - DIMENSIONS



TECHICAL DATA

TYPE	FKK 100	FKK 125	FKK 160	FKK 200	FKK 250	FKK 315	FKK 355	FKK 400
Q_n (m^3/h)	170	230	330	470	700	1160	1570	2040
Δp_p G4 (Pa)	50	50	50	50	50	50	50	50
Δp_p M5 (Pa)	70	70	70	70	70	70	70	70
Δp_k (Pa)	250	250	250	250	250	250	250	250
ØD (mm)	98	123	158	198	248	313	353	398
B (mm)	205	215	265	315	365	425	472	515
H (mm)	170	205	235	275	325	390	435	495
C (mm)	120	140	155	180	230	330	400	455
L (mm)	220	252	267	302	352	452	512	574

Other dimensions enabled on request.

MARKS	
Q_n	Nominal air flow
Δp_p (G4)	Initial pressure drop on the filter for G4 class
Δp_p (M5)	Initial pressure drop on the filter for M5 class
Δp_k	Initial pressure drop on the filter (backfilled filter)

OP: Ordering marks, see page 41.

Pass box

SPECIFICATION

- Transient chamber for transferring material from one room to another with different classes of cleanliness
- Built-in mechanical interlock system for door locking, option without door lock
- Made from polished stainless sheet AISI 304
- Doors with thermally strengthened glass 10 mm thickness
- Installation of connections for supply and discharge of air from the chamber
- Installation option with UV-C sterilizing light. Operation of UV lamps is determined on the control panel, once the door is opened the UV lamp is automatically switched off. Installing an optional UV filters on the door for user protection
- Installation option with no door lock

PASS BOX

TECHICAL DATA

Type	Dimensions of the working area (mm) height x width x depth of the handle to handle	External dimensions (mm) height x width x depth of the handle to handle
PB 666	600 x 600 x 600	700 x 700 x 770
PB 444	400 x 400 x 400	500 x 500 x 570

Other dimensions enabled on request.

Air shower TKA

SPECIFICATION

- Air shower dimensions according to the dimensions of the space whereat the device is installed
- Work space dimensions according to client's requirements
- Air shower is made out of cleanroom panels
- Panels can be made from:
  - Galvanized steel sheet laminated in colour 25 µm thick
  - Aluminium sheet laminated in colour 60 µm thick
  - Galvanized steel sheet laminated in antibacterial colour 110 µm thick
  - Aluminium sheet laminated in antibacterial colour 110 µm thick
  - Stainless sheet (option: lamination in antibacterial colour 110 µm thick)
- One leaf/Double leaf door
- Automatic door locking during operations (20 sec.), panic button in case of emergency
- High static pressure fan
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard. Additional built-in HEPA pre-filters
- Control: microprocessor controlled parameters from the control panel, touch screen
- Exhaust grilles

AIR SHOWER

PRINCIPLE OF OPERATION

Fan draws air through set of pre-filters that filter out larger particles. Then the fan pushes the air towards the absolute HEPA filters. Through jet nozzles filtrated air enters the working space in a speed of 25-30 m/s. Sheer kinetic energy enable this jets to remove particles from personal entering cleanroom. This process can be managed either with 100% recirculation or certain air quantity can be expelled and replaced with new absolutely clean air being drawn in, thus creating under pressure within air shower work space.

TECHICAL DATA

Design with various dimensions enabled on request.

Validations and services

SPECIFICATION

- Servicing, maintenance and validation of equipment or facility ensures operational safety and longer life cycle
- Maintenance of newly constructed or reconstructed spaces and facilities
- Validation according to international regulations and standards, EN 12469 for microbiological safety cabinets, GMP and ISO standards for cleanrooms
- HVAC balancing
- CNUS/BMS
- Electrical cabinets
- Measurment device calibration
- Filter integrity test
- Particles counting in working space
- Space recovery test
- Visualization test
- Monitoring
- Noise and vibration test
- Level and uniformity of illumination
- Documentation testing

SEVICES

- Complete care of the plant, system or device
- Partial services
- Customers requested validations

ORDERING

Absolute ceiling filter FAC:
FAC-V 471x328/F 313/H13/INT

FAC-V	- connector type for air supply on housing
471	- housing width B (mm)
328	- housing height H (mm)
F 313	- connector diameter D (mm)
H13	- HEPA filter class according to EN 1822
ANK	- diffuser plate

Absolute duct filter FAK:
FAK 309x614x450/H14

FAK	- product code
309	- housing width B (mm)
614	- housing height H (mm)
450	- housing length L (mm)
H14	- HEPA filter class according to EN 1822

Absolute duct filter with grille FAR:
FAR 665x630x200/H13

FAR	- product code
665	- housing width B (mm)
630	- housing height H (mm)
200	- housing length L (mm)
H13	- HEPA filter class according to EN 1822

Bag duct filter rectangular FKV-P:
FKV-P 1223x613x750-F7

FKV-P	- product code
1223	- housing width B (mm)
613	- housing height H (mm)
750	- housing length L (mm)
F7	- bag filter class according to EN 779

Bag duct filter cylindrical FKV-C:
FKV-315 C-F8

FCV-C	- product code
315	- nominal diameter
F8	- bag filter class according to EN 779

Absolute filter with active coal FKU:
FKU 309x614x600 (additional code)

FKU	- product code
309	- housing width B (mm)
614	- housing height H (mm)
600	- housing length L (mm)
( )	- additional code for anorganic substances in the air stream

Duct filter FKK:
FKK 250-M5

FKK	- product code
250	- nominal diameter
M5	- duct filter class according to EN 779

LAMINAR DEVICES, PROTECTIVE BOOTHS AND CABINETS

Protective booths and cabinets are an integral part of every modern laboratory and pharmaceutical facilities. Drug manufacture includes complete pharmaceutical process of technologcial finished medicinal product formatting, including the production or receipt of goods and materials, technological processing and equipment, quality verification, storage and delivery.

Production of drugs is carried out in accordance with clearly defined procedures, regulations and requirements - Act on Medicinal Products and Medical Devices RC, PIC recommendations, GMP guidelines, ISO standards, FDA and PDA technical reports in order to reduce the risk of microbiological contamination and decrease particle contamination to a minimum.

Klimaoprema Cleanroom Solutions manufactures laminar booths and cabinets, microbiological safety cabinets, weighing/containment booths and a number of special devices designed in accordance with EU GMP guidelines that adheres to reputation of drug manufacturers implementing the highest quality standards by customers. We design the complete manufacturing premises and carry out validations of the supplied equipment to confirm that the equipment is functioning properly in accordance with regulations, fintess to purpose and complying to the needs of the customer.

We design cleanrooms for production of sterile pharmaceuticals in which air is supplied through a filter of the appropriate efficiency (HEPA) and it is necessary to maintain the difference in pressures between individual zones. Premises must be designed as to meeting the requirements for number of particles at-rest and in operation, while these conditions must be defined for each room (class) separately. The filtered air must have a positive pressure relative to surrounding areas under all operating conditions to effectively flush the area.

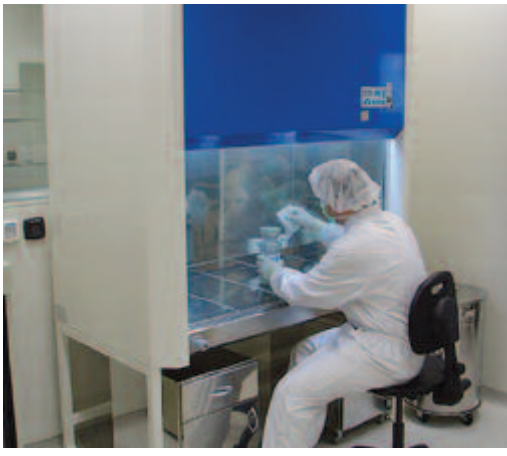
Protective booths and cabinets are designed in a way that repairs and replacement of the filter is performed in a clean room.

Parts of the manufacturing equipment comes into contact with the product must not be reactive, additive or absorptive to the extent that it can affect product quality. The equipment should be designed for easy batch resizing, cleaning and disinfection. Protective booths and cabinets protect the operator, work object and working environment from potential contamination or biohazard during the testing and work with microorganisms and microbes. Infectious particles, bacteria and viruses, single cell and multicellular heterotrophic organisms and as well as aclotrphic organizsm are dangerous matter that can be treated only in laminar flow protective devices.

Laminar air flow is smooth, uniform flow of fluids (liquids and gases) in parallel layers, with no interference and turbulence between them.

It is important to choose the optimal solution with optimal cost. When such product is ordered, you don't get simply a "naked" product, but also education to work with the unit and provided service and maintenance by our engineers and technicians.

It is often necessary to ensure clean sterile conditions where space and the corresponding equipment are limited. Pharmacies and small manufacturing plants do not have to worry because we offer special devices "tailored" to the customer's requirements and restrictions preventing the application of standard units. Depending on their function, special devices ensure the protection of work objects, outstanding pharmaceutical ingredients, safe working environment for the operator and cooling of recirculating air. We are permanently oriented toward customers whose needs are monitored and analyzed with particular care by producing and delivering protective booths and cabinets for production of drugs in the form of ampules, tablets, coated tablets, capsules, ointments, gels, emulsions, suspension and syrups.



Portable laminar flow hood KTP-A

SPECIFICATION

- Protection type: protection of work objects
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: manually controlled parameters
- Construction: laminated steel and special cleanroom profiles
- Desktop: stainless perforated steel
- Workspace: protected by glass walls
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Replacement filter: change is made on the upper side, without touching the workspace
- Noise: low noise level
- Lighting: FLUO lamp > 750 lux
- Takes up a little space

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Wall outlet (230 V)
- Bactericidal UV lamp
- Differential pressure gauge for control of HEPA filter filling
- Cabinet operating hours counter
- UV lamp operating hours counter
- Also available in stainless steel

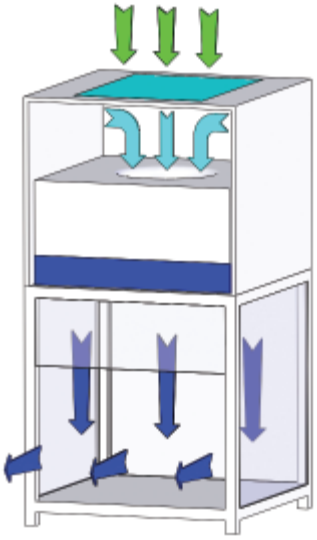
TECHICAL DATA

Type	KTP-A II	KTP-A IV
External dimensions (mm)	494 x 556 x 950	645 x 710 x 950
Workspace (mm) width x depth x height	459 x 459 x 470	610 x 610 x 470
Max. power (W)	130	180
HEPA filter H14 (EN 1822) mm	457 x 457 x 69	610 x 610 x 69
Air exchange (m^3/h)	450	600
Voltage/frequency (V/Hz)	230/50	230/50
Weight (kg)	40	50

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

Cabinet takes the air through a pre-filter that filters out larger particles. Then the fan pushes the air towards the absolute HEPA filter. Thanks to a special distribution system, the air flows laminary into the workspace and provides high degree of workspace purity.



KEY:

- ambient air
- recirculation air
- HEPA filtered air

Horizontal laminar flow hood KTH-S

SPECIFICATION

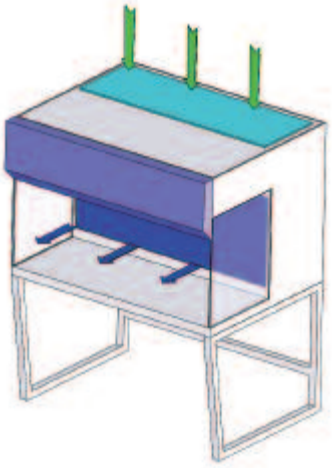
- Protection type: protection of work objects
- Air flow type: laminar, horizontal
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: laminated steel
- Desktop: polished stainless steel
- Workspace: stainless steel AISI 304
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Lighting: FLUO lamp > 750 lux
- Safety: adverse state visual alarms
- Noise: low noise level
- Cabinet operating hours counter

PRINCIPLE OF OPERATION

Cabinet takes the air through a pre-filter that filters out larger particles. Then the fan pushes the air towards the absolute HEPA filter. Thanks to a special distribution system, the air flows laminary into the workspace and provides high degree of workspace purity.

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Electrical outlets in the workspace (230 V)
- Differential pressure gauge for control of HEPA filter filling
- Stand (height: 750 mm sitting, standing 950 mm)
- Also available in stainless steel
- Bactericidal UV lamp
- UV lamp operating hours counter



TECHICAL DATA

Type	KTH-S I	KTH-S II	KTH-S III	KTH-S IV
External dimensions (mm)	970 x 1025 x 880	1275 x 1025 x 880	1580 x 1025 x 880	1885 x 1025 x 880
Workspace (mm) width x depth x height	940 x 500 x 610	1245 x 500 x 610	1550 x 500 x 610	1855 x 500 x 610
Max. power (W)	1600	1600	1650	1650
Max. connection at socket (W)	550	550	550	550
Voltage/frequency (V/Hz)	230/50	230/50	230/50	230/50
Weight (kg)	200	255	285	315

Other dimensions enabled on request.

KEY:

- ambient air
- recirculation air
- HEPA filtered air

CE

Vertical laminar flow hood KTV-S

SPECIFICATION

- Protection type: protection of work objects
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: laminated steel and special cleanroom profiles
- Desktop: polished stainless steel
- Workspace: stainless steel AISI 304, electric lifting of protective front glass
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Lighting: FLUO lamp > 750 lux
- Safety: adverse state visual alarms
- Noise: low noise level
- Cabinet operating hours counter
- Bactericidal UV lamp
- UV lamp operating hours counter
- Electrical outlets in the workspace (230 V)

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Differential pressure gauge for control of HEPA filter filling
- Stand (height: 750 mm sitting, standing 950 mm)
- Also available in stainless steel

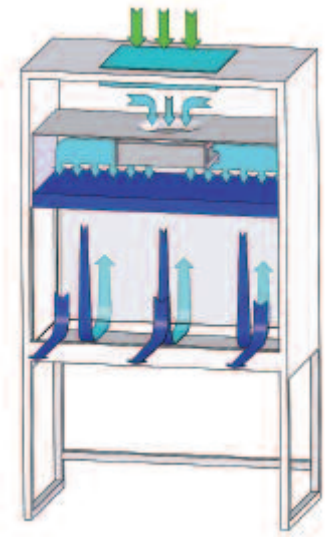
TECHICAL DATA

Type	KTV-S I	KTV-S II	KTV-S III	KTV-S IV
External dimensions (mm) width x depth x height	1030 x 825 x 2200	1335 x 825 x 2200	1640 x 825 x 2200	1945 x 825 x 2200
Workspace (mm) width x depth x height	885 x 610 x 660	1190 x 610 x 660	1495 x 610 x 660	1800 x 610 x 660
Max. power (W)	1800	1800	1850	1850
Max. connection at socket (W)	550	550	550	550
Voltage/frequency (V/Hz)	230/50	230/50	230/50	230/50
Weight (kg)	270	300	320	350

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

Absolute filtered air flows laminary into the workspace. One part of the air (25-30%) is released to the surrounding area by the operator, while the other portion of air (70-75%) is recirculated through the desktop via the HEPA absolute filters. The air that was flown into the environment is replenished with a new air entering the recirculation system through a prefilter G4 class.



KEY:

- ambient air
- recirculation air
- HEPA filtered air

CE

Vertical laminar flow hood KTV-A

SPECIFICATION

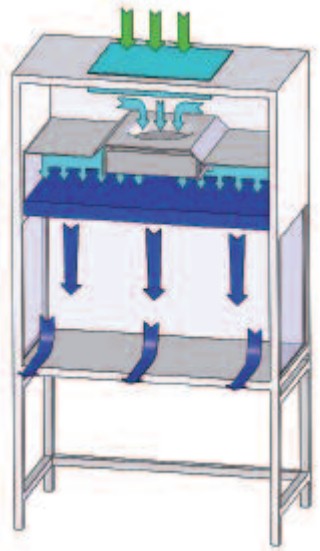
- Protection type: protection of work objects
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: laminated steel and special cleanroom profiles
- Desktop: polished stainless steel
- Workspace: protected by glass walls
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Lighting: FLUO lamp > 750 lux
- Safety: adverse state visual alarms
- Noise: low noise level
- Cabinet operating hours counter

PRINCIPLE OF OPERATION

Cabinet takes the air through a pre-filter that filters out larger particles. Then the fan pushes the air towards the absolute HEPA filter. Thanks to a special distribution system, the air flows laminary into the workspace and provides high degree of workspace purity.

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Electrical outlets in the workspace (230 V)
- Bactericidal UV lamp
- UV lamp operating hours meter
- Differential pressure gauge for control of HEPA filter filling
- Stand (height: 750 mm sitting, standing 950 mm)
- Also available in stainless steel



KEY:

- ambient air
- recirculation air
- HEPA filtered air

TECHICAL DATA

Type	KTV-A I	KTV-A II	KTV-A III	KTV-A IV
External dimensions (mm) width x depth x height	970 x 750 x 2020	1275 x 750 x 2020	1580 x 750 x 2020	1885 x 750 x 2020
Workspace (mm) width x depth x height	925 x 600 x 650	1230 x 600 x 650	1535 x 600 x 650	1840 x 600 x 650
Max. connection at socket (W)	450	520	650	750
Voltage/frequency (V/Hz)	230/50	230/50	230/50	230/50
Weight (kg)	74	85	102	120

Other dimensions enabled on request.

Microbiological safety cabinet KTB-NS (Class II)

SPECIFICATION

- Protection type: protection of work objects, operator and environment
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: laminated steel and special cleanroom profiles
- Desktop: polished stainless steel
- Workspace: stainless steel AISI 304, electric lifting of protective front glass
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Lighting: FLUO lamp > 750 lux
- Bactericidal UV light for sterilization
- Safety: adverse state visual alarms
- Noise: low noise level
- Cabinet operating hours counter
- UV lamp operating hours counter
- Electrical outlets in the workspace (230 V)

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Differential pressure gauge for control of HEPA filter and outlet HEPA filters
- Stand (height: 750 mm sitting, standing 950 mm)
- Also available in stainless steel

TECHICAL DATA

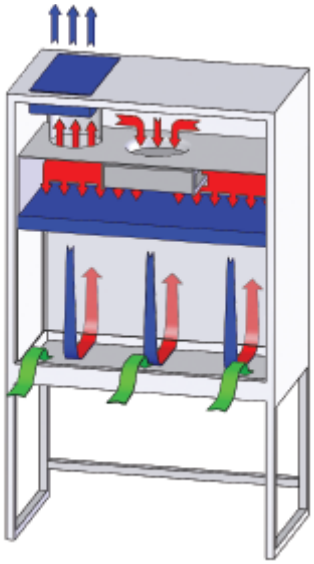
Type	KTB-NS I	KTB-NS II	KTB-NS III	KTB-NS IV
External dimensions (mm) width x depth x height	1030 x 825 x 2200	1335 x 825 x 2200	1640 x 825 x 2200	1945 x 825 x 2200
Workspace (mm) width x depth x height	885 x 610 x 660	1190 x 610 x 660	1495 x 610 x 660	1800 x 610 x 660
Max. power (W)	1800	1800	1850	1850
Max. connection at socket (W)	550	550	550	550
Voltage/frequency (V/Hz)	230/50	230/50	230/50	230/50
Weight (kg)	270	300	320	350

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

In microbiological safety cabinets 70% of the contaminated air is recirculated through a HEPA filter and while the remaining 30% is blown out over another HEPA filter. The incoming air flows laminary at the speed 0.45 m/s in the workspace, providing an absolutely clean working area.

This airflow design enables the system compatible with 1, 2 and 3 biocontamination levels.



KEY:

- contaminated air
- HEPA filtered air
- ambient air

CE

Microbiological safety cabinet KTB-VS (Class II)

Special model with absolute prefilter for high-risk laboratories

SPECIFICATION

- Protection type: protection of work objects, operator and environment
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: laminated steel and special cleanroom profiles
- Desktop: polished stainless steel
- Workspace: stainless steel AISI 304, electric lifting of protective front glass
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard. In addition, the built in HEPA pre-filters
- Lighting: FLUO lamp > 750 lux
- Bactericidal UV light for sterilization
- Safety: adverse state visual alarms, visual and audible filter status alarm
- Noise: low noise level
- Cabinet operating hours counter
- UV lamp operating hours counter
- Electrical outlets in the workspace (230 V)

OPTIONAL INSTALLATION

- Connections for various media (gas, air, vacuum, water)
- Differential pressure gauge for control of HEPA filter and outlet HEPA filters
- Stand (height: 750 mm sitting, standing 950 mm)
- Also available in stainless steel

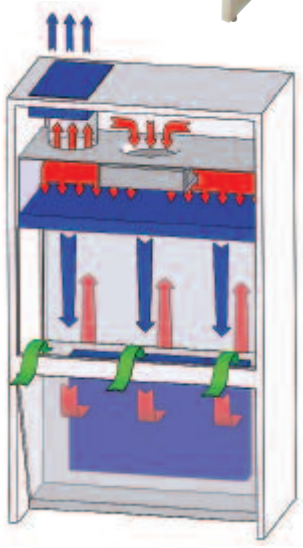
TECHICAL DATA

Type	KTB-VS I	KTB-VS II	KTB-VS III	KTB-VS IV
External dimensions (mm) width x depth x height	1030 x 825 x 2200	1335 x 825 x 2200	1640 x 825 x 2200	1945 x 825 x 2200
Workspace (mm) width x depth x height	885 x 610 x 660	1190 x 610 x 660	1495 x 610 x 660	1800 x 610 x 660
Max. power (W)	1800	1800	1850	1850
Max. connection at socket (W)	550	550	550	550
Voltage/frequency (V/Hz)	230/50	230/50	230/50	230/50
Weight (kg)	270	300	320	350

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

In microbiological safety cabinets 70% of the contaminated air is recirculated through a HEPA filter and while the remaining 30% is blown out over another HEPA filter. The difference compared to conventional microbiological cabinet are HEPA prefilters with large surfaces, installed under the working table. All the incoming and recirculating air is purified through HEPA prefilters, so that the output and working filters are exposed to contaminated air only during replacement. Replacement of HEPA prefilters is performed during normal operation of the cabinet. Filter segments are dismantled in the workspace, in a protective atmosphere, and then sealed in plastic bags. This will ensure complete protection when servicing the cabinet in hazardous agents working.



KEY:

- contaminated air
- HEPA filtered air
- ambient air

CE

IVF hood

SPECIFICATION

- Protection type: protection of work objects
- Air flow type: laminar, vertical
- Air flow velocity: 0:25 to 0:45 m/s, with setup options
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Cabinet control: microprocessor controlled parameters from the control panel, touch screen
- Construction: stainless steel and special cleanroom profiles
- Desktop: polished stainless steel
- Temperature of the working surface: hot plate 22ºC-45ºC, adjustable
- Workspace: protected by glass walls
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Lighting: FLUO lamp > 750 lux
- Safety: adverse state visual alarms, visual and audible filter status alarm
- Power: 230 V, 50 Hz
- Stand (height: 750 mm sitting, standing 950 mm)
- Noise: low noise level
- Cabinet operating hours counter

OPTIONAL INSTALLATION

- LCD monitor 19"
- CO_2 incubator 14-16 liter capacity
- Connections for various media (gas, air, vacuum, water)
- Electrical outlets in the workspace (230 V)
- Stereomicroscope: increase of min. 120 times, camera adapter
- Bactericidal UV lamp
- UV lamp operating hours meter
- Differential pressure gauge for control of HEPA filter filling

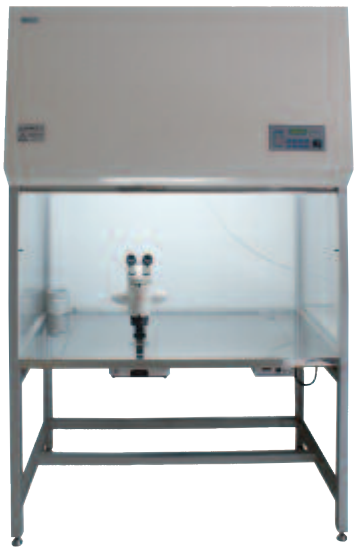
TECHICAL DATA

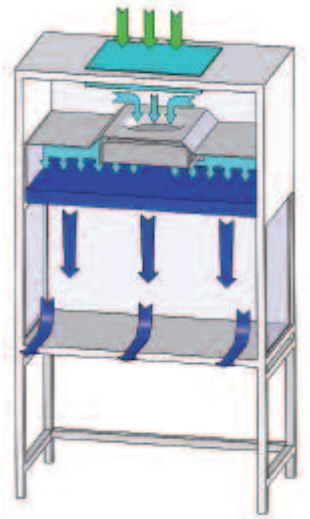
Type	IVF I	IVF II	IVF III	IVF IV
External dimensions (mm) width x depth x height	970 x 750 x 2120	1275 x 750 x 2120	1580 x 750 x 2120	1885 x 750 x 2120
Workspace (mm) width x depth x height	925 x 600 x 750	1230 x 600 x 750	1535 x 600 x 750	1840 x 600 x 750
Max. power (W)	450	520	650	750
Max. connection at socket (W)	230/50	230/50	230/50	230/50
Voltage/frequency (V/Hz)	84	95	112	130
Weight (kg)	270	300	320	350

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

Cabinet takes the air through a pre-filter that filters out larger particles. Then the fan pushes the air towards the absolute HEPA filter. Thanks to a special distribution system, the air flows laminary into the workspace and provides high degree of workspace purity.





KEY:

- ambient air
- recirculation air
- HEPA filtered air

CE

UV sterilization cabinet

SPECIFICATION

- Protection type: protection of work objects and operator from UV light. Constant decontamination within the workspace
- Type of air flow: circular recirculating stream
- Number of air exchanges in the workspace: 50 exchanges/h
- Construction: stainless steel AISI 304
- Glass: double layer, UV-tight (laminated)
- Recirculaiton assembly: inside the cabinet mask, consisting of fans, UV lamp and G4 filters (EN 779) for dust
- UV lamp: 8.000 hours, embedded in the workspace top, UV radiation disinfects the working area by destroying the DNA/RNA fragments during 15-30 minute exposure. Other UV lamp inside the control assembly
- Automatic shut-off of the UV lamp after opening the protective glass, UV bulb timer for 30 min
- Lighting: FLUO lamp 15W
- Cabinet operating hours counter
- UV lamp operating hours counter
- Noise: low noise level
- **When the operator is working UV lamp inside the working area must not be in operation**

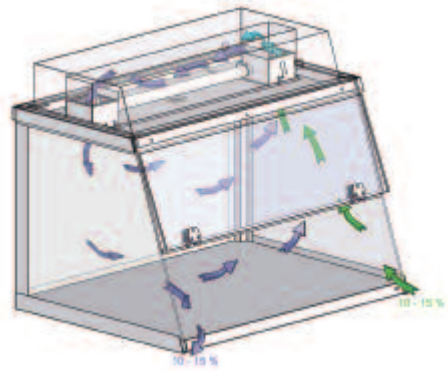
TECHICAL DATA

Type	
External dimensions (mm) width x depth x height	690 x 515 x 555
Workspace (mm) width x depth x height	675 x 500 x 405

Other dimensions enabled on request.

PRINCIPLE OF OPERATION

UV cabinet is started with a key, and automatically runs the fan and includes the UV lamp inside the recirculation assembly. The fan pulls in the air from the work area through the G4 class filter eliminating larger contaminants and directing it toward the UV recirculation assembly in which the UV lamp sterilizes the air flow. Sterilized air flow is brought back into the working area thorugh outcoming perforation on the ceiling of UV cabinet and the cycle is repeated. During the operation, a certain amount of air from the working area comes under glass in the room while the same amount of air from the room enters the working area of the cabinet.



KEY:

- ambient air
- partially filtered air
- sterilized air

Laminar flow booth KA

SPECIFICATION

- Type of protection: protection of work objects in a large working spaces
- Air flow type: laminar, vertical
- Air flow velocity: 0.45 m/s ± 20%
- Operating speed: 0.30, 0.35, 0.40, 0.45 m/s
- Preliminary (stand-by) mode: 0.25 m
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Workspace: shielded with UV stable PVC strips
- Construction: stainless satinated sheet AISI 304 (DIN 1.4301)
- Booth control: microprocessor controlled parameters from the control panel, touch screen
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Pre-filters: G4 to F9 class (EN 779)
- Safety: automatic filter and device failure control (visual and audible alarms)
- Lighting: integrated lighting, 500 lux at operating height
- Booth operating hours counter

OPTIONAL INSTALLATION

- Differential pressure gauge for control of HEPA filter filling
- UV bactericidal lamp for sterilization
- UV lamp operating hours counter
- **Explosion proof Ex**, certificates for installed components

ASSEMBLY

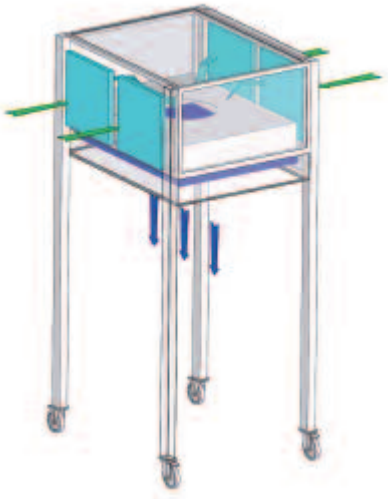
- Suspended from the ceiling
- Set on the fixed bearing beams
- Placed on poles with wheels

TECHICAL DATA

Design with various dimensions enabled on request.

PRINCIPLE OF OPERATION

Booth takes the air through a pre-filter that filters out larger particles. The fan pushes the air through HEPA filter. Thanks to a special distribution system, the air flows laminary into the workspace and provides absolutely clean atmosphere.



KEY:

- ambient air
- recirculation air
- HEPA filtered air

Weighing/containment booth VKA

SPECIFICATION

- Type of protection: safe working environment for the operator to prevent inhalation of hazardous particles, booth environment protection prevents particles generation inside the booth to be distributed outside, protection of open pharmaceutical matter from contamination by maintaining laminary air flow within the booth and by help of the air curtain on the entrance (PVC)
- Air flow type: laminar, vertical
- Operating speed: 0.30, 0.35, 0.40, 0.45 m/s
- Preliminary (stand-by) mode: 0.25 m
- Purity class: ISO class 5 (4), 100 (10) class per U.S.F.S.209 E, GMP class A
- Construction: stainless satinated AISI 304 (DIN 1.4301)
- Booth control: microprocessor controlled parameters from the control panel, touch screen
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Pre-filters: G4 to F9 class (EN 779)
- Safety: automatic filter and device failure control (visual and audible alarms)
- Lighting: integrated lighting, 500 lux at operating height
- This device is designed to operate in three shifts
- PVC protective curtain
- Booth operation hours counter

OPTIONAL INSTALLATION

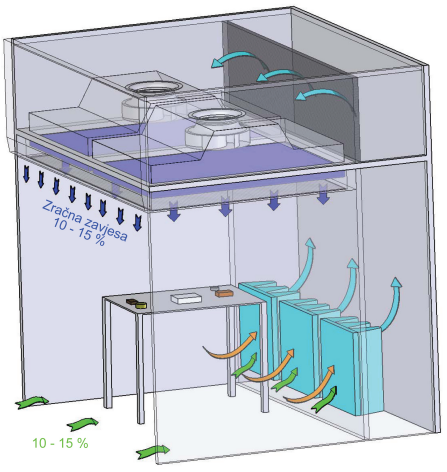
- Additional visual filter control (moderate differential pressure gauge)
- Curtain: prevents contamination of the working area, built at the entrance to the booth
- Refrigerator
- Bactericidal UV light for sterilization
- UV lamp operating hours counter
- Safe Change housing
- **Explosion proof Ex**, certificates for installed components

TECHICAL DATA

Design with various dimensions enabled on request.

PRINCIPLE OF OPERATION

Fans direct air flow through the set security HEPA filters and the air enters into the workspace in the vertical laminar stream. Of the total volume of air, 10-15% is discharged into the environment, thus increasing the purity of space. At the bottom of the workspace the air is pulled through the prefilter and together with the ambient makes up for the exact amount of air that was previously blown out. The air flow is filtered through a HEPA filter and the cycle is repeated.



KEY:

- ambient air
- partially filtered air
- HEPA filtered air
- partially contaminated air

Weighing/containment booth VKO

SPECIFICATION

- Type of protection: safe working environment for the operator to prevent inhalation of hazardous particles, booths environment protection prevents particles generation inside the booth to be distributed outside, protection of open pharmaceutical matter from contamination by maintaining laminary air flow within the booth
- **Level of exposure to operators - 100 µg/m³**
- Air flow type: laminar, vertical
- Operating speed: 0.30, 0.35, 0.40, 0.45 m/s
- Preliminary (stand-by) mode: 0.25 m
- Purity class: ISO class 6 (5), 1000 (100) class per U.S.F.S.209 E, GMP class A
- Construction: stainless satinated sheet AISI 304 (DIN 1.4301)
- Booth control: microprocessor controlled parameters from the control panel, touch screen
- Cooling of the recirculation air, air recirculation cooler
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- Two stage prefiltration
- Safety: automatic filter and device failure control (visual and audible alarms)
- Lighting: integrated lighting, 500 lux at operating height
- This device is designed to operate in three shifts

OPTIONAL INSTALLATION

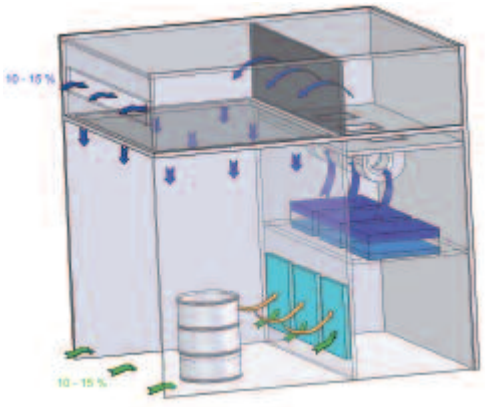
- Additional visual filter control (moderate differential pressure gauge)
- Safe Change housing
- **Explosion proof Ex**, certificates for installed components

TECHICAL DATA

Design with various dimensions enabled on request.

PRINCIPLE OF OPERATION

The fans pull the air through the perforation on the bottom of the workspace. The air flow passes through the two-stage prefiltration and the set of HEPA filters. When passing through the cooler the air enters into distribution plenum. The total volume of air enters the workspace over polyester cartridges and the rest is discharged into the environment. This amount of air is made up by pulling the air from the outside.



KEY:

- ambient air
- HEPA filtered air
- partially contaminated air

Weighing/containment booth VKL

SPECIFICATION

- Type of protection: safe working environment for the operator to prevent inhalation of hazardous particles, booths environment protection prevents particles generation inside the booth to be distributed outside, protection of open pharmaceutical matter from contamination by maintaining laminary air flow within the booth
- **Level of exposure to operators - 100 µg/m³**
- Air flow type: laminar, vertical
- Operating speed: 0.30, 0.35, 0.40, 0.45 m/s
- Preliminary (stand-by) mode: 0.25 m
- Purity class: ISO class 6 (5), 1000 (100) class per U.S.F.S.209 E, GMP class A
- Construction: stainless satinated sheet AISI 304 (DIN 1.4301)
- Booth control: microprocessor controlled parameters from the control panel, touch screen
- Main filter: HEPA H14 efficiency 99.995% MPPS according to EN 1822 standard
- The first stage of filtration through G4-F9 filter (EN 779)
- Safety: automatic filter and device failure control (visual and audible alarms)
- Lighting: integrated lighting, 500 lux at operating height
- Protective glass: lifting of the protective glass by electric motor drive
- Scale stand
- Built-in DOP (DEHS) test connectors for each filter unit
- This device is designed to operate in 3 shifts
- Adjusted to seated position
- Booth operating hours counter

OPTIONAL INSTALLATION

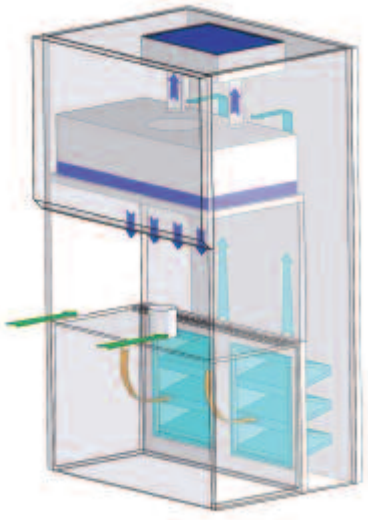
- Additional visual filter control (moderate differential pressure gauge)
- UV lamp for sterilization of work surfaces
- Electrical outlets in the workspace (230 V)
- Connections for various media (gas, air, vacuum, water)
- Bottom of the barrel on wheels
- **Explosion proof Ex**, certificates for installed components

TECHICAL DATA

Design with various dimensions enabled on request.

PRINCIPLE OF OPERATION

Fans direct the air flow through prefilters. Part of the filtered air (70%) together with the ambient air (30%) passes through the pre-filter. Workspace of the booth is protected by retractable glass, which prevents contamination of pharmaceuthical substances.



KEY:

- ambient air
- partially filtered air
- HEPA filtered air
- partially contaminated air

CE

Special devices

It is often necessary to ensure clean sterile conditions where space and the corresponding equipment are limited. We produce special devices that are „tailored“ to the customer's requirements and restrictions preventing the use of standard devices.

SPECIFICATION

- Dimensions of workspaces upon requests
- Horizontal or vertical air flow
- Choice of operating speed
- Preliminary (stand-by) mode
- Microprocessor controlled parameters from the control panel
- Automatic filters and device failure control (visual and audible alarms)
- Additional visual filter control (differential pressure gauge)
- Absolute filtration through HEPA and ULPA filters
- Refrigerator for air recirculation
- The equipment is designed to operate in 3 shifts
- Integrated lighting
- Produced according to internationally recognized GMP guidelines and EN standards
- **Option: Ex explosion proof design**

SUBJECT TO PROTECTION

- Protecting the environment booth, preventing the particles generated inside the booth to get distributed outside
- Protection of work objects from contamination in large workplaces, maintaining adequate, laminar, absolutely clean air inside the booth/cabinet
- Safe working environment for the operator, preventing the operator inside the booth to breathe in health-threatening particles
- Cooling of recirculating air

When working with a protective device, it is important that the operator feels comfortable. The discomfort and distress can lead to an accident. The operator must be able to sit or stand so that his/her arms are in natural position for work on the counter desktop and must be able to reach all items without stretching. The operator must be able to see through the workspace, not to look beneath it and his/her field of vision may not be the obstructed by glass holders.

Cabinet workspace must not be cluttered, too much preparation and accessories prevents the air flow. When all the work is done in the cabinet, the fan has to work for a few minutes more before shut dow and adjustment of the front cover.

Validations and services

SPECIFICATION

- Servicing, maintenance and validation of equipment or facility ensures operational safety and longer life cycle
- Maintenance of newly constructed or reconstructed spaces and facilities
- Validation according to international regulations and standards, EN 12469 for microbiological safety cabinets, GMP and ISO standards for cleanrooms
- HVAC balancing
- CNUS/BMS
- Electrical cabinets
- Measurment device calibration
- Filter integrity test
- Particles counting in working space
- Space recovery test
- Visualization test
- Monitoring
- Noise and vibration test
- Level and uniformity of illumination
- Documentation testing

SERVICES

- Complete care of the plant, system or device
- Partial services
- Customers requested validations

CLEANROOM FURNITURE

Cleanroom furniture is used in various industries where it is necessary to prevent contamination and the spread of bacteria, viruses and other contaminants. It is used in pharmaceutical and medical industries, as well as in electronics, engineering, automotive, optical, food and other industries.

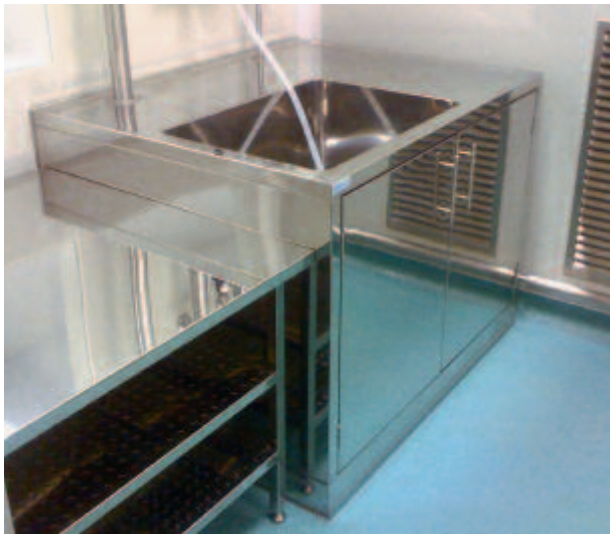
Each square meter of the cleanroom zone is essential, usable and often limited space, which is why standard furniture often is not the optimal solution. Klimaoprema Cleanroom Solutions designs and manufactures cleanroom furniture according to spatial requirements and user needs. The following information are related to standard furniture, but we are aslo designing the furniture in specific dimensions and characteristics, according to user requirements.

Cleanroom furniture is made from stainless steel (inox), and consists of vertical holders and perforated surface or a surface made from another material. Furniture is simply handled, easy to maintain and suitable for all cleanroom types.

Cleanroom tables

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Various worktop materials: perforated plate, Kerrock, glass, marble, stainless sheet or other metal
- Polystyrene or rockwool filling
- Designed for safe use of chemicals and portable laboratory instruments
- They are used in various laboratory types, in chemical production, in schools, in medical industry, electronics, food industry
- Different sizes and dimensions depending on the space size and user requirements
- Adjustable height
- Various models: curves, double desks, conference tables, drawers under the table, fixed tables, mobile tables (with wheels) and others.



TECHNICAL DATA

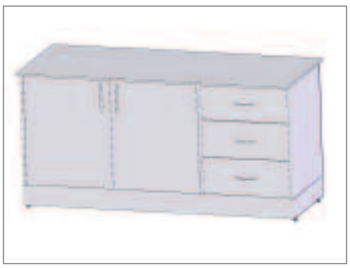
Length (mm)	Width (mm)	Hight (mm)
1000	700	900
1200	700	900
1600	700	900

Other dimensions enabled on request.

Cleanroom drawers

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Different sizes and dimensions depending on the space size and user requirements
- Various models: with drawers, with doors, with drawers and doors, with shelves, lockable, fixed drawers, mobile (with wheels), drawers for under the table and others.



TECHICAL DATA

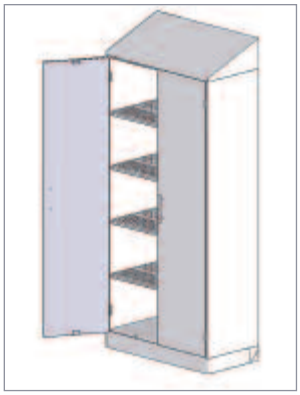
Length (mm)	Width (mm)	Hight (mm)
500	600	600
500	650	600
500	700	600

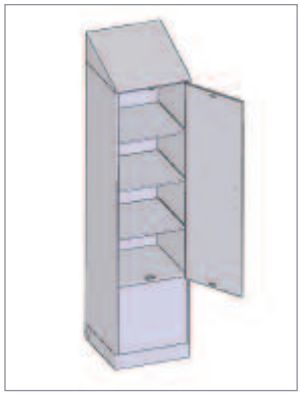
Other dimensions enabled on request.

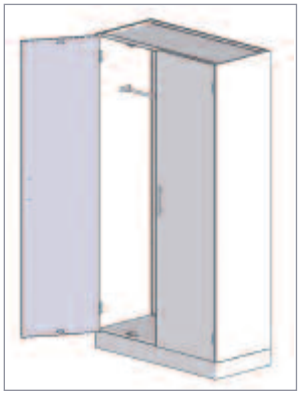
Cleanroom cabinets

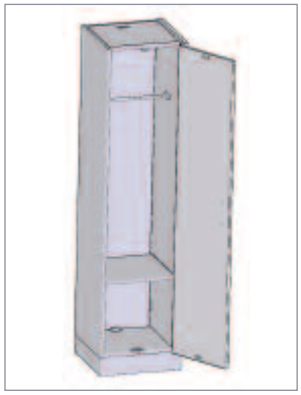
SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Smooth or perforated shelves
- Easy to clean and disinfect surfaces
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements
- Various models: with doors, with drawers and doors, with shelves, lockable, mobile (with wheels), with hinged or sliding doors, etc.





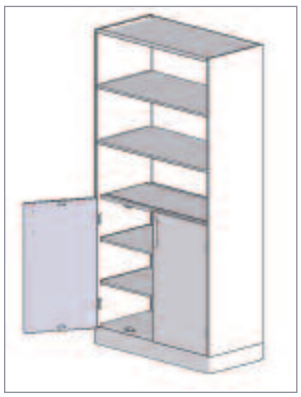


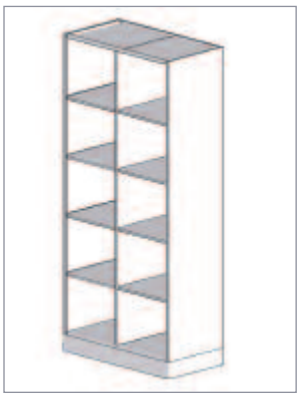


Cleanroom shelves and wire shelves

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Smooth or perforated shelves
- Easy to clean and disinfect surfaces
- Wire shelves and shelves provide a cost-effective and efficient storage of materials for production
- Different sizes and dimensions depending on the space size and user requirements
- Various models: freestanding shelves, wall shelves, mobile (with wheels) shelves, etc.

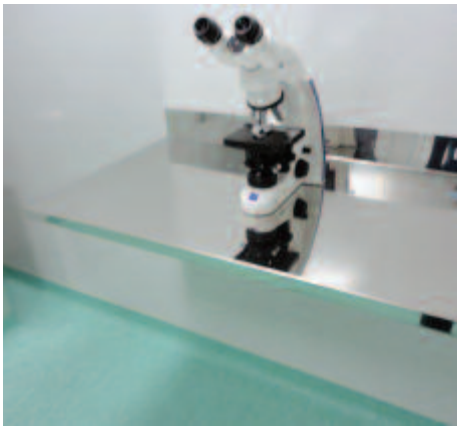




TECHICAL DATA

Length (mm)	Width (mm)	Hight (mm)
1000	250	400
1200	500	400
1600	600	400

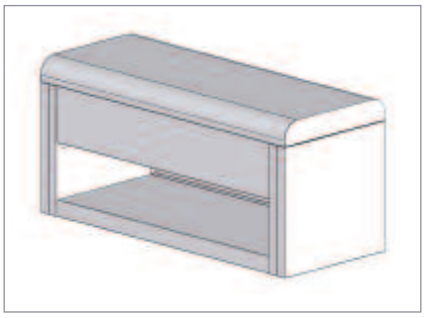
Other dimensions enabled on request.

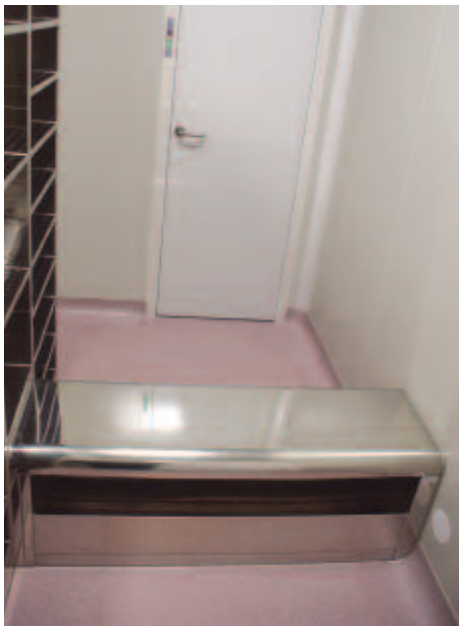


Benches

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Easy to clean and disinfect surfaces
- Functional barrier to separate different areas
- Cleanroom seating surfaces
- With or without shoe compartments
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements





TECHICAL DATA

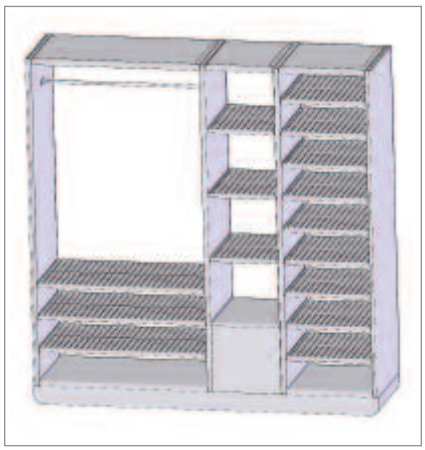
Length (mm)	Width (mm)	Hight (mm)
1000	400	450
1200	400	450
1600	400	450

Other dimensions enabled on request.

Coat hangers

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Stable, highly durable, easy to handle
- Easy to clean and disinfect surfaces
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements
- Various models: mobile, fixed, double



Cleanroom sinks

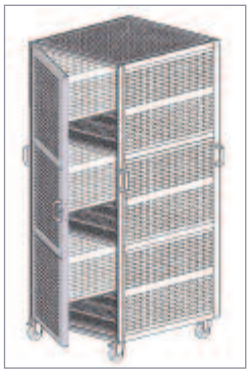
SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Easy to clean and disinfect surfaces
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements
- Various models: wall mounted sinks, freestanding sinks, hanging sinks, toilet sinks, surgical sinks, double sinks, etc.
- Additional equipment: faucets, strainers, baskets, caps, etc.

Cleanroom trolley

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Designed for transport of various materials
- Stable, highly durable, easy to handle
- Easy to clean and disinfect surfaces
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements
- Various models: with or without brakes on wheels, open or with doors, locking, shelves and others.



Instruments holder

SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Designed for transport of various materials
- Stable, highly durable, easy to handle
- Easy to clean and disinfect surfaces
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements

Other furniture and accessories

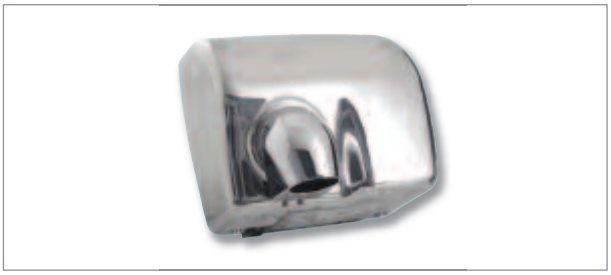
SPECIFICATION

- Stainless steel sheet metal - stainless steel, brushed or polished
- Polystyrene or rockwool filling
- Stable, highly durable, easy to handle
- Easy to clean and disinfect surfaces
- Modern design
- Suitable for laboratories, medical industry, food and other industries
- Different sizes and dimensions depending on the space size and user requirements
- Various models: electronic launch, manual launch, foot launch and other

WASTE BASKETS

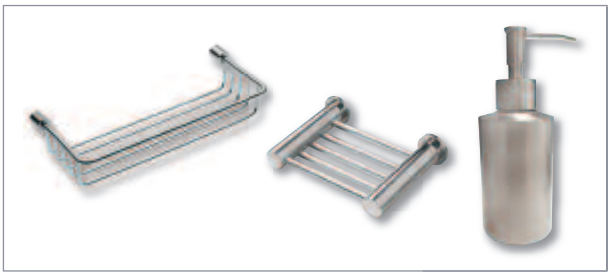
TOWEL HOLDERS

HAND DRYERS



PAPER HOLDERS

SOAP DISHES



Notes:

Notes:

In over 35 years of experience Klimaoprema Cleanroom Solutions has equipped thousands of square meters in pharmaceuticals and medical facilities.

Many projects were carried out on by **turnkey** solution which includes: design and engineering, manufacture, installation, equipment, validation and service.

Contact us with confidence and we will make your vision or idea come true.

ENGINEERING

PRODUCTION

INSTALLATION

VALIDATION

klimaoprema
CLEANROOM SOLUTIONS

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