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Why Molecular Filtration?

Air pollution caused by traffic, manufacturing, power plants, agriculture and even forest fires is a growing problem in our industrialized world.

Molecular gaseous compounds are invisible and all around us. Some of these compounds are so toxic, and yet so hard for us to detect, that they can do us harm with our even realizing we have been exposed.

Unfortunately we are routinely being subjected to such hazardous compounds in our offices, our homes, our cities and even during our leisure time.

The impact of such exposure can be significant. High ozone or volatile organic compound (VOC) levels represent a serious health threat for all of us. At the same time air pollution can damage everything from valuable artifacts in museums to exposed surfaces in our homes and offices.

In manufacturing environments Airborne Molecular Contamination (AMC) can cause a variety of problems. In semiconductor manufacturing, for example, AMC can reduce product yield, corrode valuable optical components and damage a wide range of process equipment.

In other industries, as products and processes become more complex and more sensitive to all types of contamination, the control of AMC will become an ever more critical part of ensuring product quality and improving process yield rates.



Filter test rig in Camfil Tech Center, Sweden



Gigacheck



Campure Coupon

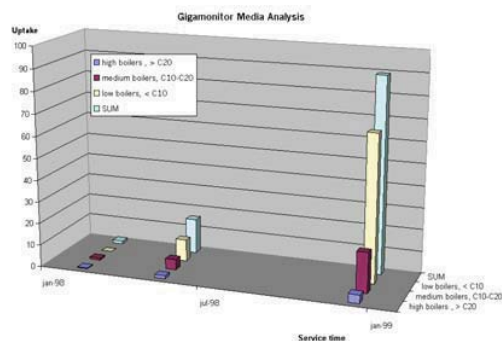
Additional services

Camfil offers a wide range of AMC focused services that allow our customers to remain focused on their core business. These service include filter life time analysis, real time online measurement of contaminants and passive sampling to precisely determine the type and concentration of the problem compounds.

Once local analysis has been completed our AMC experts can propose comprehensive AMC solutions based on the minimum possible Life Cycle Cost available to meet customer needs.

Camfil is the only filter company equipped with a full size filter test facility designed to performance test not just filter media samples but also full size filters under precisely simulated conditions. This full size filter testing is the basis for all our published technical data and can be used to test filter performance against wide and varied range of AMC challenges under precise temperature, humidity and air flow conditions.

This type of performance data can be invaluable when it comes to determining the optimal solution for any specific AMC challenge.



Example: Rest capacity check of a molecular filter in operation

Ozone rating



Camfil introduce an ozone removal efficiency classification for molecular filters.

Ozone may be removed from air by molecular filters. To help customers assess the effectiveness of different products, Camfil introduce an ozone removal efficiency rating system. This is a first in the filtration industry.

Ozone

Ozone is a naturally occurring gas that is widely present in our environment at ground level. The ozone molecule is composed of three oxygen atoms, rather than the two atoms of normal oxygen. Ozone is formed by the interaction of other gaseous pollutants such as oxides of nitrogen and volatile organic compounds (VOCs) under the influence of ultraviolet (UV) light. City centre levels of ozone increase during periods of high sunlight. Ozone is classed as an oxidising agent, and has the potential to damage or destroy other molecules.

Ozone and human health

Ozone is an extremely reactive gas and inhalation of ozone can be harmful to human health. The presence of ozone in air may be readily correlated to hospital admission rates relating to respiratory illness. Symptoms of ozone exposure include; throat irritation, aggravation of asthma, decrease in lung function and increased susceptibility to respiratory infection. Ambient ozone levels and high alerts may be available on local government websites in many parts of the world.

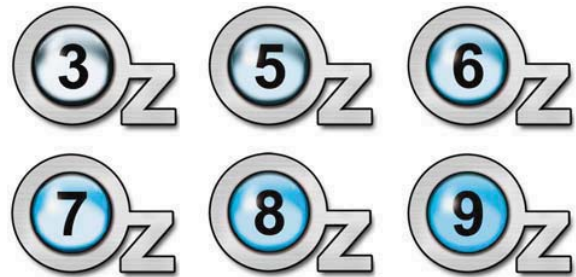
Removing ozone from the air

Molecular filters reduce ozone levels in the air through processes of adsorption and decomposition.

Measuring ozone removal efficiency

Camfil use a unique test rig to measure ozone removal efficiency. Temperature and relative humidity conditioned air is blown through full size production filters. Ozone is injected into the airstream and sensitive ozone detectors measure the concentration upstream and downstream of the filter. Filter efficiency is readily calculated from the up- and downstream ozone concentrations.

Camfil are market leaders in the validation of performance of molecular filters. Filters can be challenged with many different gases and vapours. Using temperatures between 5 and 50 deg C and relative humidity values between 30% and 90%, we can determine the performance of our filters under the conditions present in our customer applications.



Filter Type	Average Ozone Removal Efficiency	Ozone Rating
City-Flo XL	35%	3
CityPleat 200 2"	50%	5
CityPleat 480 4"	65%	6
CitySorb	70%	7
City-Flo	80%	8
CityCarb	90%	9
(i) All filters tested at 2.5 m/s face velocity (500 fpm); (ii) Ozone challenge = 150 – 450 ppb; (iii) Temperature = 22 deg C; iv) Relative humidity = 50%)		

All the filters use a high quality broad spectrum adsorbent, based on activated carbon to destroy the ozone molecules. Laboratory tests show that filters based on the use of potassium permanganate, which is itself a strong oxidising agent are unlikely to be as effective.

Our "City" - Products

Sick-Building-Syndrome

Sick-Building-Syndrome is the negative impact on health of human beings caused by harmful substances.

The sources of harmful substances are outside e.g. traffic, power plants, industrial manufacturing, forest fires and bacteria. Inside of buildings e.g. furniture's, coatings, carpets and detergents.

All these chemical, harmful substances together can cause headache, fatigue, allergy and decreasing concentration.

Our 2-in-1 principle

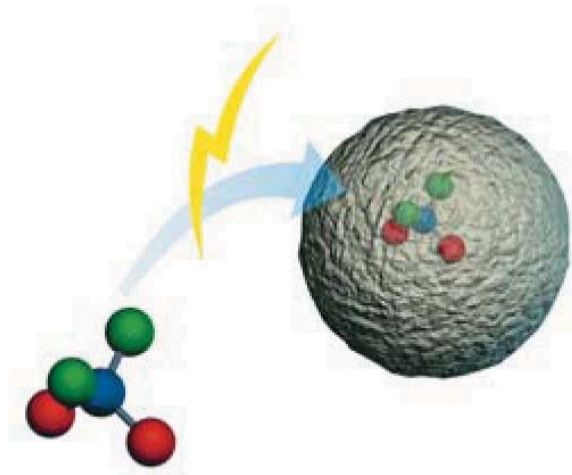
Our CityPleat, CityFlo and CityCarb filter are able to remove particles, bacteria, spores, air pollution and smell. As a result the indoor air quality (IAQ) index is significantly improved.

This improvement is due to:

1. High efficiency particle filtration: filter class F7 / F9 according EN 779.
2. Adsorption of volatile organic compounds (VOC) including smell, sulfur dioxide and ozone: High efficiency through RAD principle.

RAD Principle

RAD stands for Rapid Adsorption Dynamics and is the basis for high efficiency gas filtration. Our filters are able to remove effectively smell and gaseous air pollutants. Ozone for instance is removed with an efficiency higher than 90% thanks to the high efficiency media used in Citycarb. Camfil is using best-in class media to achieve a relative long life time of the filters.



Easy installation

Our filters can be easily installed due to the customer friendly HF frame set. The "City" filters can be normally installed in the existing bag filter frames.

Active against dust, air pollution and smell with only one filter!



Molecular media selection chart

Target molecule	No. of carbon atoms & performance indicator										Can't fit molecular media	Formula	Molecular weight	Boiling point (°C)	Vapour pressure (mmHg @ 20°C)
	C1	C2	C3	C4	C5	C6	C7	C8	C9	>C9					
Alkanes															
Methane												CH ₄	16.0	-161.5	33.903
Ethane												C ₂ H ₆	30.1	-88.6	28.127
Propane												C ₃ H ₈	44.1	-42.1	6.274
Butane											LOS	C ₄ H ₁₀	58.1	-0.6	1.557
Pentane											LOS	C ₅ H ₁₂	72.2	36.1	426.4
Hexane											LOS	C ₆ H ₁₄	86.2	68.7	123.0
Heptane											LOS	C ₇ H ₁₆	100.2	98.4	47.3
Octane											LOS	C ₈ H ₁₈	114.2	125.5	12.1
Nonane											LOS	C ₉ H ₂₀	128.3	150.6	3.60
Decane										#	LOS	C ₁₀ H ₂₂	142.3	173.8	20.3
Dodecane											LOS	C ₁₂ H ₂₆	170.3	216.3	0.98
Eicosane (td)											LOS	C ₂₀ H ₄₂	282.6	343.0	0.98
Cyclododecane						#					LOS	C ₁₂ H ₂₂	84.2	80.7	7.80
Alkenes															
Ethylene			#								OS	C ₂ H ₄	28.1	-103.7	26.627
Propylene												C ₃ H ₆	42.1	-47.7	7.628
Butene												C ₄ H ₈	56.1	-6.3	1.910
Pentene											LOS	C ₅ H ₁₀	70.1	30.0	549.8
Hexene											LOS	C ₆ H ₁₂	84.2	63.0	190.1
Heptene											LOS	C ₇ H ₁₄	98.2	94.0	47.1
Octene											LOS	C ₈ H ₁₆	112.2	121.0	14.4
Nonene											LOS	C ₉ H ₁₈	126.2	146.9	3.30
Decene										#	LOS	C ₁₀ H ₂₀	140.3	170.0	1.28
1,3-butadiene											LOS	C ₄ H ₆	54.1	-4.6	1.838
1,3-hexadiene											LOS	C ₆ H ₁₀	82.1	59.0	173
Pinene (td)											LOS	C ₁₀ H ₁₆	136.2	156.2	3.53
Arenes (Aromatic)															
Benzene											LOS	C ₆ H ₆	78.1	80.1	75.8
Toluene											LOS	C ₇ H ₈	92.1	110.6	21.7
Ethylbenzene											LOS	C ₈ H ₁₀	106.2	136.2	6.98
Styrene											LOS*	C ₈ H ₈	104.1	145.0	4.6
Xylene											LOS*	C ₈ H ₁₀	106.2	144.4	6.00
Trimethylbenzene											LOS	C ₉ H ₁₂	120.2	164.7	1.88
Naphthalene										#	LOS	C ₁₀ H ₈	128.2	218.0	0.08
Biphenyl											LOS	C ₁₂ H ₁₀	154.2	255.9	0.00
Alcohols															
Methanol												CH ₃ OH	32.0	64.7	97.7
Ethanol											LOS	C ₂ H ₅ OH	46.1	78.5	44.3
Isopropanol											LOS	C ₃ H ₇ OH	60.1	82.2	34.6
Butanol											LOS	C ₄ H ₉ OH	74.1	117.0	5.70
Pentanol											LOS	C ₅ H ₁₁ OH	88.2	138.0	4.50
Hexanol											LOS	C ₆ H ₁₃ OH	102.0	158.0	0.98
Heptanol											LOS	C ₇ H ₁₅ OH	116.2	175.8	0.11
Octanol											LOS	C ₈ H ₁₇ OH	130.2	195.0	0.14
Nonanol											LOS	C ₉ H ₁₉ OH	144.3	214.0	0.01
Decanol										#	LOS	C ₁₀ H ₂₁ OH	158.3	232.0	0.01
Ethylene glycol												C ₂ H ₆ O ₂	62.1	198.0	0.08
Phenol											LOS	C ₆ H ₅ OH	94.1	181.7	0.16

Target molecule	No. of carbon atoms & performance indicator										Pos C	CanRit molecular media	Formula	Molecular weight	Boiling point (°C)	Vapour pressure (mmHg @ 20°C)		
	C1	C2	C3	C4	C5	C6	C7	C8	C9	>C9								
Nitriles																		
Acetonitrile											UGS		C ₂ H ₃ N	41.3	81.0	72.7		
Acrylonitrile											UGS ^a		C ₃ H _{3.5} N	53.3	77.5	93.0		
Organic acids																		
Formic acid	+	+									CEX A6	CEX A2	UGS	CH ₂ O ₂	46.0	100.5	324.3	
Acetic acid		+	+								CEX A6	CEX A2	UGS	CH ₃ COOH	60.1	118.2	112.3	
Propionic acid				+							CEX A6	CEX A2	UGS	C ₃ H ₇ O ₂	74.1	141.0	91.9	
Butyric acid					+						CEX A6	CEX A2	UGS	C ₄ H ₈ O ₂	88.1	164.0	74.1	
Benzoic acid							+				CEX A6	CEX A3	UGS	C ₇ H ₆ O ₂	122.1	249.8	10.00	
Acid gases																		
Hydrogen fluoride											+	CEX A3	CEX A6	UGS	HF	20.0	19.5	675
Hydrogen sulfide											+	CEX A1	CEX A3	C15	H ₂ S	34.1	-60.3	135.76
Hydrogen chloride											+	CEX A3	CEX A6	UGS	HCl	36.5	-85.0	31.525
Sulfur dioxide											+	CEX A3	C15	UGS	SO ₂	64.1	-10.0	2.479
Chlorine											+	CEX A3	C5	UGS	Cl ₂	70.9	-34.1	5,049
Hydrogen cyanide											+	CEX J5			HCN	27.02	25.6	621
Nitrogen dioxide											+	CEX A6	UGS		NO ₂	46.0	21.2	720
Ammonia and Amines																		
Ammonia											+	CEX B1			NH ₃	17.0	-33.4	6,430
Methylamine	+										+	CEX B1			CH ₃ N	31.1	-6.9	2,280
Trimethylamine			+	+							+	CEX B1			C ₃ H ₉ N	59.1	3.0	1,365
Pyridine					+						UGS	CEX	CEX	C ₅ H ₅ N	79.1	115.0	15	
N-methylpyrrolidine						+					UGS	CEX	CEX B1	C ₅ H ₉ NO	99.1	202.0	1.95	
Trimethylamine						+					UGS	CEX	CEX	C ₃ H ₉ N	101.2	89.0	53.3	
Toluidine											UGS	CEX	CEX B1	C ₇ H ₉ N	107.2	203.0	0.30	
Nicotine											UGS	CEX	CEX B1	C ₁₀ H ₇ N	162.2	246.0	0.08	
Triethylamine										+	CEX B1	UGS	CEX	C ₆ H ₁₅ N	185.4	216.6	0.18	
Hydrazine											+	CEX B1			N ₂ H ₄	32.1	113.5	15.8
Miscellaneous compounds																		
Carbon monoxide															CO	28.0	-191.5	-
Carbon dioxide															CO ₂	44.0	-78.5	42,871
Acetylene															C ₂ H ₂	26.0	-81.5	32,568
Radon															Rn	222.0	-61.7	10,230
Dimethyl sulfide	+										GS	GS	C4	C ₂ H ₆ S	62.1	37.0	420	
Ethylmercaptan	+										CEX A1	CEX A3	GS	C ₂ H ₅ SH	62.1	35.0	439	
Hexamethyldisilazane (HMDS)											UGS	CEX		C ₆ H ₁₈ NSi ₂	162.4	101.0	39.9	
Toluene-2, 4-dicyano-5-oxo-azotic (TDA)											UGS	CEX		C ₇ H ₃ N ₃ O	174.2	251.0	0.010	
Diethylenetriamine (DETA or DTP)											UGS	CEX		C ₆ H ₁₂ N ₃	146.2	188.0	18.8	
Diisopropylamine (DIPA)											UGS	CEX		C ₈ H ₁₈ N	130.2	150.2	5.70	
Diisobutylamine (DIBA)											UGS	CEX		C ₈ H ₁₉ N	131.2	151.0	5.70	
Mercury vapour										+	CEX J4	CEX J3		Hg	200.6	356.7	0.0015	
Hydrogen peroxide											UGS	CEX		H ₂ O ₂	34.0	150.2	5.70	
Ozone											UGS	CEX		O ₃	48.0	-111.9	0	

Target molecule	No. of carbon atoms & performance indicator											Camif molecular media	Formula	Molecular weight	Boiling point (°C)	Vapour pressure (mmHg @ 20°C)	
	C1	C2	C3	C4	C5	C6	C7	C8	C9	>C9	non C						
Esters																	
Methyl acetate												LGS		C ₄ H ₈ O ₂	74.1	57.1	186.2
Ethyl acetate												LGS		C ₄ H ₈ O ₂	88.1	77.0	72.6
Vinyl acetate												LGS		C ₄ H ₆ O ₂	86.1	72.7	93.3
Methyl acrylate												LGS		C ₅ H ₈ O ₂	86.0	80.0	66.9
Methyl acetate												LGS	CEX	C ₄ H ₈ O ₂	100.1	103.0	30.0
Methyl methacrylate												LGS	CEX	C ₅ H ₈ O ₂	100.1	105.0	22.0
Ethyl acrylate												LGS	CEX	C ₅ H ₈ O ₂	100.1	99.0	32.6
Propyl acetate												LGS	CEX	C ₆ H ₁₂ O ₂	102.1	102.0	28.4
Ethyl lactate												LGS	CEX	C ₅ H ₁₀ O ₃	118.1	154.0	1.65
Ethyl methacrylate												LGS	CEX	C ₆ H ₁₀ O ₂	114.1	118.5	25.4
Isopropyl acrylate												LGS	CEX	C ₆ H ₁₀ O ₂	114.1	110.0	20.4
Butyl acetate												LGS	CEX	C ₆ H ₁₂ O ₂	116.2	122.0	8.03
Propylene glycol methyl ether acetate												LGS	CEX	C ₆ H ₁₂ O ₄	132.2	146.0	3.68
Butyl acrylate												LGS	CEX	C ₇ H ₁₂ O ₂	128.2	145.0	4.43
Pentyl acetate												LGS	CEX	C ₇ H ₁₄ O ₂	130.2	149.0	7.50
Ethylene acrylate										#		LGS	CEX	C ₆ H ₈ O ₂	170.2	67.0	-
Ethers																	
Ethylene oxide												LGS		C ₂ H ₄ O	44.1	11.0	1,088
Propylene oxide												LGS		C ₃ H ₆ O	58.1	34.3	443
Dioxetil ether												LGS		C ₄ H ₁₀ O	74.1	34.6	464.0
Dimethoxyethane												LGS		C ₄ H ₁₀ O	90.1	85.0	55.7
Dioxane												LGS		C ₄ H ₈ O	88.1	101.1	28.2
Nitroce												LGS		C ₄ H ₈ O	108.1	154.0	1.63
Tetrahydrofuran												LGS		C ₄ H ₈ O	72.1	67.0	150
Dioxymel ether											#	LGS	CEX	C ₄ H ₈ O	170.2	257.9	0
Aldehydes																	
Formaldehyde												DS	CEX J2	CH ₂ O	30.0	-19.3	3,315
Acetaldehyde												DS	CEX J2	CH ₃ CHO	44.1	20.2	833
Acrolein												LGS		C ₂ H ₃ CHO	56.1	52.5	248.3
Propanal												LGS		C ₃ H ₇ O	58.1	48.8	255
Butanal												LGS		C ₄ H ₈ O	72.1	75.7	90
Pentanal												LGS		C ₅ H ₁₀ O	86.1	103.0	30
Hexanal												LGS		C ₆ H ₁₂ O	100.2	128.0	7.5
Benzaldehyde												LGS	CEX	C ₇ H ₆ CHO	106.1	179.0	0.98
Heptanal												LGS	CEX	C ₈ H ₁₆ O	114.2	153.0	2.63
Nonanal											#	LGS	CEX	C ₁₀ H ₁₈ O	142.3	93.0	0.92
Ketones																	
Acetone												LGS ^a		C ₃ H ₆ O	58.1	56.0	209.3
Methyl ethyl ketone												LGS ^a		C ₅ H ₁₀ O	72.1	78.2	79.5
Cyclohexanone											#	LGS ^a	CEX ^a	C ₆ H ₁₀ O	98.1	156.0	2.09
Alkyl halides (Halogenated)																	
Dichloromethane												LGS		CH ₂ Cl ₂	84.9	40.7	352.5
Chloroform												LGS		CHCl ₃	119.4	61.7	159.8
Carbon tetrachloride												LGS		CCl ₄	153.8	76.7	89.6
Vinyl chloride														CH ₂ CHCl	62.5	-13.4	2,355
Ethyl chloride												LGS		C ₂ H ₅ Cl	64.5	12.0	1,013
Trichloroethylene														C ₂ HCl ₃	131.4	87.0	58.0
Tetrachloroethylene												LGS		C ₂ Cl ₄	165.8	121.4	14.2

Adsorption guide



Adsorption not possible

Adsorption not possible

Substances mark as this colour are neither adsorbed by Camfil's activated carbon/alumina nor other company's activated carbon/alumina



Low adsorption



Medium adsorption



Good adsorption



Good adsorption, use impregnated molecular media



Chemicals in the same functional group with higher molecular weight or carbon atoms will also have good adsorption

Camfil molecular media

LGS, CEX

Unimpregnated activated carbon, coconut shell carbon, coal carbon

CEX A1, A

Impregnated activated carbon

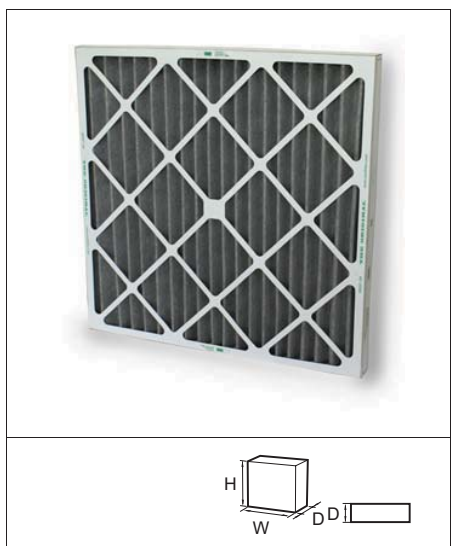
C4, C5, C8, C15

Impregnated activated alumina

Instructions:

1. The chart lists common compounds based on chemistry and increasing number of carbon atoms
2. Find the target molecule in the left hand column
3. If the target molecule is found
 - i. Check performance indicator (colour code) in columns 2 to 12 to understand how effective molecular filtration would be
 - ii. In columns 13-15, see which molecular filtration media should be applied
4. If target molecule is not in the list
 - i. Identify which chemical group the molecule belongs to (e.g. alcohols, aromatics, acid gases, etc...)
 - ii. Count the number of carbon atoms in the target molecule and find the molecular weight and boiling point values with the MSDS
 - iii. Find the molecule in the chart with same number of carbons atoms
 - iv. Use the recommendation for this molecule only if its boiling point and molecular weight are lower or equal to those of the target molecule
 - v. If not, use the recommendation for the molecule in the list with one carbon atom less than your target molecule

CityPleat



Advantages

- Compact "2 in 1" solution
- Double action: particle and odour filtration
- Ideal for filtering most low concentration interior and exterior pollutants
- 100% incinerable
- Can be used to upgrade existing installations
- Range of standard sizes

Application: High efficiency particle filtration for deodorisation and removal of gas pollutants, used for filtration in offices, airports.

Type: Prefilter for gas and particles removal.

Frame: Moisture resistant cardboard.

Media: Synthetic fibre and broad spectrum carbon.

EN779:2012 filter class: G4.

ASHRAE 52.2:2007 filter class: MERV 7.

Recommended temperature: 0 - 40°C.

Recommended relative humidity: 30 - 70%.

Recommended final pressure drop: 250 Pa.

Maximum final pressure drop: 350 Pa.

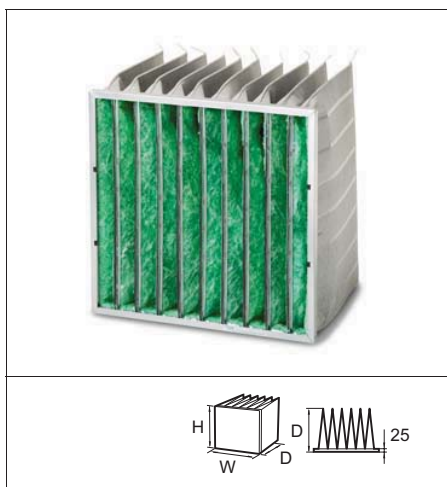
Ozone removal efficiency: 50 - 70% depending on model and air flow.

All values are +15%.

Model	Width	Height	Depth	Filter Class	Air flow m ³ /h	Pressure drop	Volume m ³	Weight kg
CityPleat-100-594x594x44	594	594	44	G4	1900	135	0,019	1
CityPleat-100-289x594x44	289	594	44	G4	900	135	0,01	0,5
CityPleat-200-594x594x44	594	594	44	G4	3175	135	0,019	1,8
CityPleat-200-289x594x44	289	594	44	G4	1500	135	0.10	0,9
CityPleat-200-594x594x95	594	594	95	G4	3185	110	0.039	2
CityPleat-200-289x594x95	289	594	95	G4	1500	110	0.019	1
CityPleat-480-594x594x95	594	594	95	G4	3185	90	0.039	3,8
CityPleat-480-289x594x95	289	594	95	G4	1500	90	0.019	1,9

*Full size test in Camfil molecular filtration test rig.

City-Flo



Advantages

- Double action: particle and molecular filtration
- Range of standard sizes
- Can be used to upgrade existing installations
- Ideal for filtering most low concentration interior and exterior pollutants
- Robust metal header frame

Application: Particle and odour removal in Hospitals, Offices, Airports etc.

Type: Multi pocket particle and molecular filter.

Frame: Galvanised steel.

Media: Glass fibre and broad spectrum carbon.

EN779:2012 efficiency: F7.

Temperature: 50°C maximum in continuous service.

Humidity: 70% RH maximum.

Holding frames: Front and side access holding frames are available: Type 8, Type L and FC Housings.

Width	Height	Depth	Filter class	Air flow m ³ /h	Pressuredrop	Bags	area m ²	Volume m ³	Weight kg	Initial eff. %	ME %	Energy class	Energy consumption kWh/y
592	592	534	F7	3400	140	10	6,2	0,2	6	62	55	D	1823
490	592	534	F7	2700	140	8	5	0,2	4,6			D	
287	592	534	F7	1700	140	5	3,1	0,1	3,5			D	

* ME%: Minimum efficiency ref. to EN779:2012

* Energy Consumption, kWh/year: Calculated according to Eurovent Guideline 4/11

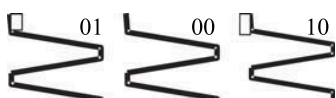
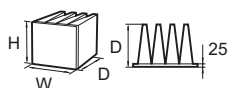
* Energy class: Calculated according to Eurovent 4/11

Industry leading bag filter construction is available with an additional molecular filtration media layer to provide gas filtration and enhanced IAQ.

City-Flo is the ultimate solution when a high performance bag filter and a high performance molecular (gas, odour) filter must be installed in a single location. City-Flo filter can easily be fitted into new or existing standard filter frames. High performance Camfil glass fibre media is combined with an exclusive "Broad Spectrum" carbon media that exploits the benefits of "Rapid Adsorption Dynamics" (RAD) to remove a very wide range of VOCs and odours. Molecular pollutants are released from both external sources (traffic fumes, power generation, industry) and internal sources (building construction and finish materials, wooden materials, carpets, cleaning agents etc.).

The filter should be replaced when the pressure loss exceeds the maximum allowable value for the ventilation system or after a maximum of one year. In accordance with good practice, used City-Flo filters should be bagged immediately after removal and disposed of by the appropriate route.

CityCarb®



Advantages

- **Double function:** particle and molecular filtration
- **Ideal for filtering low concentrations of most external and internal source pollutants**
- **100% incinerable**
- **Can be used to upgrade existing installations**
- **Range of standard sizes**
- **Compact “2 in 1” solution**

Application: Particle and odour removal in Offices, Hospitals, Airports etc.

Type: Compact particle and molecular filter.

Frame: Polystyrene.

Media: Synthetic fibre and broad spectrum carbon.

ASHRAE 52.2:2007 filter class: MERV 13.

Maximum flow rate: 4000m³/h.

Mounting system: Front and side access holding frames are available: Type 8, Type L and FC housings.

Width	Height	Depth	Filter class	Air flow m ³ /h	Pressure drop	Bags	area m ²	Volume m ³	Weight kg	Initial eff. %	ME %	Energy class	Energy consumption kWh/y
592	592	292	MERV 13	3400	120		8	0,1	11,8			G	>1550
592	490	292	MERV 13	2800	120		6,6	0,1	8,5			G	
592	287	292	MERV 13	1500	120		3,5	0,05	6			G	

* ME%: Minimum efficiency ref. to EN779:2012

* Energy Consumption, kWh/year: Calculated according to Eurovent Guideline 4/11

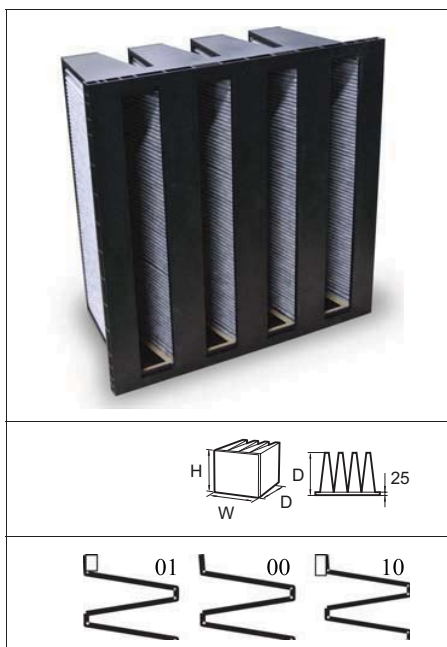
* Energy class: Calculated according to Eurovent 4/11

A compact filter with an additional molecular filtration media layer to provide enhanced IAQ through combined particle filtration and gas filtration.

CityCarb is the ultimate solution when a high performance compact filter and a high performance molecular (gas, odour) filter must be installed in a single location. CityCarb filter can easily be fitted into new or existing standard filter frames. Particle filtration media is combined with an exclusive “Broad Spectrum” carbon media that exploits the benefits of “Rapid Adsorption Dynamics” (RAD) to remove a very wide range of VOCs and odours. Molecular pollutants are released from both external sources (traffic fumes, power generation, industry) and internal sources (building construction and finish materials, wooden materials, carpets, cleaning agents etc).

The filter should be replaced when the pressure loss exceeds the maximum allowable value for the ventilation system or after a maximum of one year. In accordance with good practice, used CityCarb filters should be bagged immediately after removal and disposed of by the appropriate route.

CitySorb



Advantages

- Ideal for filtering low concentrations of most molecular pollutants from external and internal sources.
- 100% incinerable
- Range of standard sizes
- High efficiency
- Large air flow capacity
- Compact filtration solution

Application: Adsorption of odours and gasses in air conditioning applications.

Type: Rigid pleated filter.

Case: Polystyrene.

Media: Multilayer carbon media.

Sealant: Polyurethane.

Gasket: One piece PU gasket.

Recommended temperature range: 0-40°C.

Recommended relative humidity: < 70% RH.

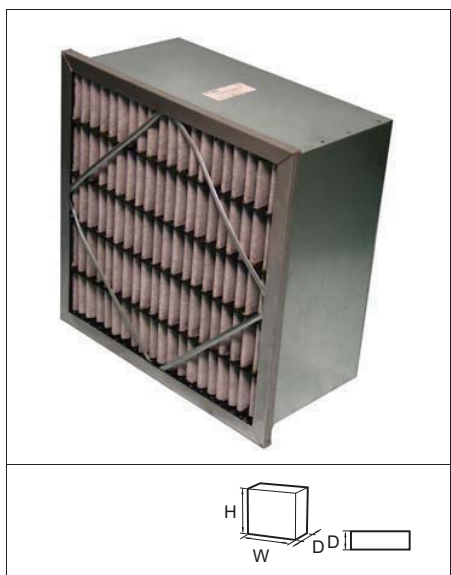
Holding frames: Front and side access housings and frames are available, Type 8, Type L and FC Housings.

Width	Height	Depth	Air flow m ³ /h	Pressure drop	Area m ²	Volume m ³	Weight kg
592	592	292	3400	80	8.0	0.1	10.8
592	490	292	2800	80	6.6	0.1	9.2
592	287	292	1500	80	3.5	0.05	5.4

A compact molecular filter to provide enhanced IAQ in buildings. CitySorb is the ultimate solution when a high performance molecular filter must be installed in the ventilation system and there is existing pre-filtration. CitySorb filter can easily be fitted into new or existing standard filter frames. "Broad Spectrum" carbon media that exploits the benefits of "Rapid Adsorption Dynamics" (RAD) is used to remove a very wide range of VOCs and odours. Molecular pollutants are released from both external sources (traffic fumes, power generation, industry etc.) and internal sources (building construction and finish materials, wooden materials, carpets, cleaning agents etc).

The filter should be replaced when the pressure loss exceeds the maximum allowable value for the ventilation system or after a maximum of one year. In accordance with good practice, used CitySorb filters should be bagged immediately after removal and disposed of by the appropriate route.

Riga-Carb



Advantages

- Standard design for removal of acids, alkalines, organic smells and condensable organics.
- Compact solution with low pressure drop
- Available as single or double header

Application: Adsorption of gases for industrial application such as harddisk facilities.

Type: Disposable carbon filter.

Frame: Galvanised steel (other on request). BH: Double Header, PH: Single Header.

Media: Type 202: nonwoven fiber material with impregnated carbon for removal of acids. Type 204: nonwoven fiber material with impregnated carbon for removal of alkalines.

Recommended temperature: 0 - 40°C.

Recommended relative humidity: 30 - 70%.

Model	WxHxD mm	Media area m ²	Air flow / pressure drop m ³ /h/Pa	Unit weight kg	Unit volume m ³
Riga-Carb CSRC-202-242412-BH	592 x 592 x 292	6	3400/75	15	0.1
Riga-Carb CSRC-202-241212-BH	287 x 592 x 292	3.2	1700/75	8	0.05
Riga-Carb CSRC-202-242412-PH	592 x 592 x 292	6	3400/75	15	0.1
Riga-Carb CSRC-202-241212-PH	287 x 592 x 292	3.2	1700/75	8	0.05
Riga-Carb CSRC-204-242412-BH	592 x 592 x 292	6	3400/75	15	0.1
Riga-Carb CSRC-204-241212-BH	287 x 592 x 292	3.2	1700/75	8	0.05
Riga-Carb CSRC-204-242412-PH	592 x 592 x 292	6	3400/75	15	0.1
Riga-Carb CSRC-204-241212-PH	287 x 592 x 292	3.2	1700/75	8	0.05

BH: Double Header; PH: Single Header

Activated Carbon and Campure Media

Effective molecular filtration media

A comprehensive range of molecular filtration medias for the control of corrosive gases, toxic gases, odours and other gaseous pollutants. The medias may be used as part of original equipment packages or as replacement for spent media.

The campure media range comprises chemically impregnated adsorbents based on activated alumina which may be use on their own or blended with activated carbon.



Demanding applications

Campure medias are designed for the most difficult and demanding applications in industrial and commercial environments. The principal areas of use include the control of acidic gases in pulp and paper, oil refining, and steel production industries. If left untreated, acidic gases

such as hydrogen sulphide, sulphur dioxide, chlorine and oxides of nitrogen may cause serious damage to key electrical equipment essential to process management. Other applications include the control of acidic and odorous gases in waste water treatment applications and the protection of sensitive artefacts in museums and art galleries.



Flexible filtration solutions and support services

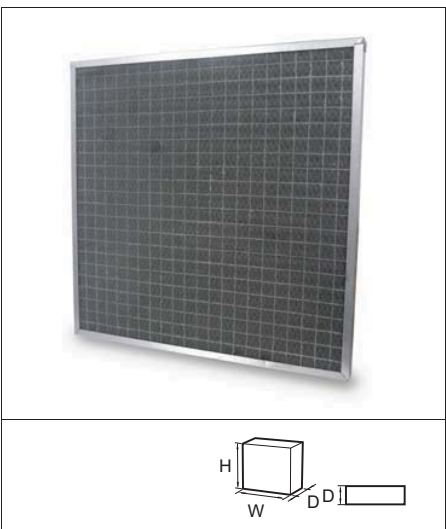
Activated carbon and campure medias may be deployed in a range of Camfil hardware systems. These allow standard and custom, solutions for all industrial and commercial applications using various media amounts and bed depths. Activated carbon and campure medias may be re-filled directly into other manufacturers hardware.

These medias are supported by a comprehensive range of technical support services including: media life analysis, corrosion monitoring coupons, on-line monitoring and media handling.

Media	Target gases	Media type
CEX003 CEX004	VOCs, hydrocarbons, general odours	Extruded activated carbon, 3 and 4mm diameter (coal based)
LGS036 LGS048	Light VOCs, hydrocarbons, general odours	Granular activated carbon (coconut shell based)
Impregnated Carbon	Acids, Alkalines, etc.	A wide range of impregnation is available.
Campure 4	H ₂ S, SO ₂ , NOX, formaldehyde, ethylene, light VOCs, Blow mol. Wt. aldehydes and organic acids	H ₂ S, SO ₂ , NOX, formaldehyde, ethylene, light VOCs, low mol. Wt. aldehydes and organic acids
Campure 5	Halogens, halogen acids and organic halides	Activated alumina with chemical impregnation
Campure 8	Enhanced removal of H ₂ S, SO ₂ , NOX, formaldehyde, ethylene, acid gases	Activated alumina with chemical impregnation
Campure 15	H ₂ S, SO ₂ , mercaptans, acid gases, chlorine	Activated alumina and activated carbon with chemical impregnation
Blends	Any of the Campure medias may be blended with either of the activated carbon based medias to provide an adsorption system that combines broad spectrum and highly specific characteristics. The usual blend ratio is 50/50 by volume.	

See individual data sheets for grade specifications

CamSure



Advantages

- Range of standard and non standard sizes
- High performance
- Suitable for a wide range of air volumes

Application: Adsorption of odours and gases in air conditioning applications.

Type: Loose fill adsorbent panels.

Frame: Galvanised steel.

Media: Campure or activated carbon based materials.

Temperature: 40°C maximum in continuous service.

Recommended relative humidity: 30 - 70%.

Mounting systems: Front and side access housings and frames are available.

Model	Dimensions (WxHxD) mm	Air flow / pressure drop m ³ /hr/Pa	Unit weight kg	Unit volume m ³
RS80D-LGS048	594 x 594 x 47	850/70	7.5	0.017
RS80D-LGS048	594 x 289 x 47	425/70	4	0.0083
CamSure-LGS048	600 x 600 x 24	680/125	9.0	0.0086
CamSure-LGS048	300 x 600 x 24	340/125	4.5	0.0043

Above are sample sizes, filters are available in a comprehensive range of sizes, please specify.

Also available with stainless steel case.

Efficient gas filtration with CamCarb

Advanced, high capacity media is used in the CamCarb cylinders to remove smell, corrosive and toxic gases as well as organics in make-up and exhaust air applications.

CamCarb design

Camfil offers a wide range of high efficient media tailored to the customer requirements. Camfil experts select the right CamCarb model and the best suitable media based on lowest cost-of-ownership to fulfill customer requirements. .

Non impregnated activated carbon is typically used to remove volatile organic compounds (VOC) including smell whereas typically impregnated activated carbon is used to remove acidic, caustic and corrosive gases.

Multiple gas filtration with one, two or three filter stages in series can be achieved in applications with unknown gas mix or when for instance VOC's acids and bases are present in the same air stream. Media blends are also available

A special designed holding plate system is used as installation frame for the CamCarb cylinders (CamCarb and CamCarb green). The system is available in three different standard sizes.

It is recommended to use a F7 pre-filter to protect the CamCarb system against particle contamination. Particles in the air block the micro pores of the high efficient activated carbon resulting in rapid performance decrease.

Enforcement of the holding plates is required in big scale CamCarb installations (e.g. make-up air unit). Camfil offers the right stabilization solution with the RZA/MZA modular frame set.

CamCarb refill service for better operational cost and to protect the environment

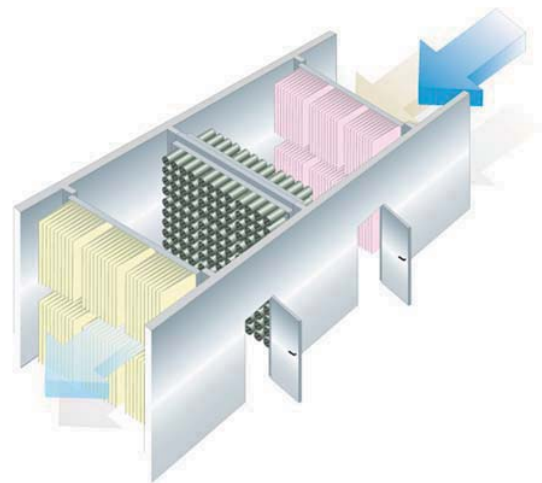
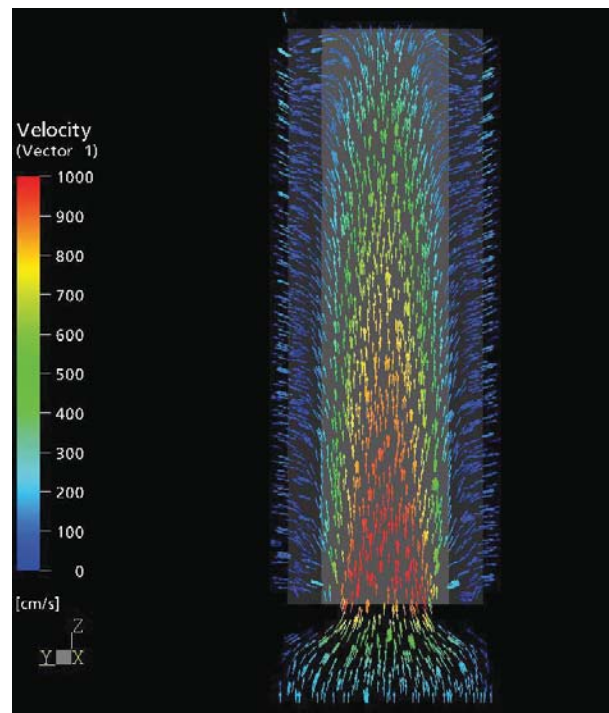
The CamCarb cylinders can be emptied and refilled with new media. This service offers lower operational cost compared to the replacement of the whole cylinder.

Camfil guarantees the same performance of the CamCarb cylinder after the refill service due to special filling technology as well as in-house QA.

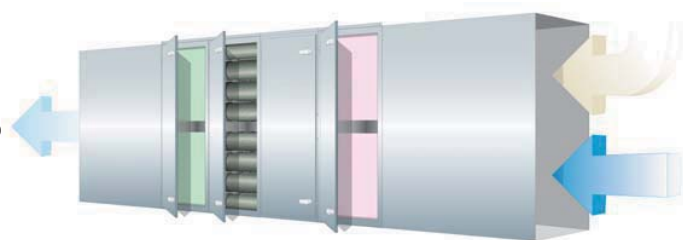
A spare set of cylinders is required to maintain the system operation during the filling process

CamCarb air flow distribution

Camfil did CFD (Computer Fluid Dynamics) simulations to design the Camcarb cylinder to achieve a uniform air flow distribution through the media resulting in longer life time compared to competitor products.



Example of RZA/MZA modular frame set system



Application in make-up air unit

CamCarb Green



Advantages

- Leak-free installation ensures maximum possible efficiency
- 360 degree geometry and even air distribution ensures maximum possible lifetime
- High level of product cleanliness
- Rapid bayonet fitting system and integral dual TPE gaskets
- Totally corrosion resistant
- Reduced weight compared to Metal version
- Modular and flexible assembly
- May be filled with a wide range of molecular filtration medias

Application: The most reliable molecular filter for high efficiency and long-term control of molecular contaminants in sensitive buildings and process industries.

Type: Cylindrical molecular filter cartridge manufactured from engineering grade resins.

Filtration media: Broad Spectrum activated carbon for control of odours

Cleanliness: Internal scrim protection.

Temperature: 40°C maximum in continuous service.

Mounting system: Dedicated base plate in 3 standard sizes (see separate page).

Model	Diameter mm	Length mm	Carbon Type	Rated Airflow m ³ /hr *	Pressure loss Pa **	Unit Weight kg	Unit volume-unpacked m ³
CCG-R 1300	148	240	CEX003	1250	65	1.55	0.005
CCG-R 2600	148	452	CEX003	2500	100	2.85	0.01
CCG-R 3500	148	595	CEX003	3400	150	3.75	0.013

* Per set of 16 cylinders on a 610 x 610 baseplate

** At rated flow. Pressure drop may vary depending on direction of installation and space in the air handling unit.

CamCarb Green filters are filled with high quality activated carbon or CamPure media and are used for high efficiency removal of molecular contaminants from supply air, recirculation air and exhaust air ventilation systems in sensitive building and process applications.

CamCarb Green filters eliminate customer problems with different categories of airborne molecules, including; odours, irritants, toxic gases and corrosives (acidic gases).

The molecular filtration media is deployed in an annular pattern with uninterrupted 360 degree geometry along the entire length of the filter. This arrangement ensures even air distribution over the entire filter area and maximizes filter lifetime.

Filters mount onto a dedicated baseplate using integrated bayonet fastenings without the need for specialized tools. Three standard sizes of the modular baseplate allow the filter installation to be accommodated in any size air handling unit, duct or plenum.

CamCarb Metal



Advantages

- Leak-free installation ensures maximum possible efficiency
- 360 degree geometry and even air distribution ensures maximum possible lifetime
- May be re-filled, lowest possible Life Cycle Cost (LCC)
- Rapid bayonet fitting system and integral dual TPE gaskets
- Stainless steel construction
- Modular and flexible assembly

Application: The most reliable molecular filter for high efficiency and long-term control of molecular contaminants in sensitive buildings and process industries.

Type: Cylindrical molecular filter cartridge manufactured from stainless steel.

Filtration media: Broad Spectrum activated carbon for control of odours

Temperature: 40°C maximum in continuous service.

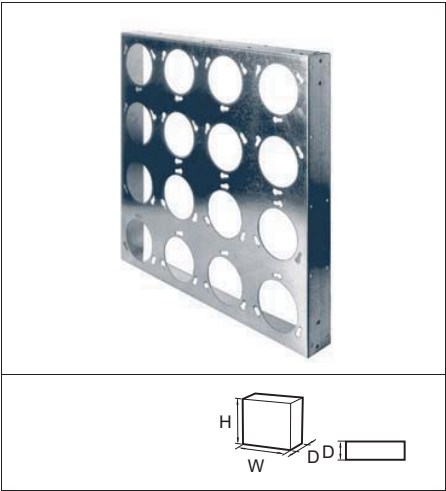
Mounting system: Dedicated base plate in 3 standard sizes (see separate page).

Model	Diameter mm	Length mm	Carbon Type	Rated Airflow m ³ /hr *	Pressure loss Pa **	Unit Weight kg	Unit volume-unpacked m ³
CC 2600	147	450	CEX003 ***	2500	100	3.9	0.01
CC 3500	147	600	CEX003	3400	150	5.2	0.14

* Per set of 16 cylinders on a 610 x 610 baseplate.

** At rated flow. Pressure drop may vary depending on direction of installation and space in the air handling unit.

CamCarb Mounting Frames (Baseplates)



Advantages

- Modular design adaptable for all types of installations
- Rapid fitting system via bayonet fitting
- Quick and easy service
- Three standard sizes
- Assembly by bolting, rivets, welding

Application: Dedicated mounting frames to ensure leak-free installation of CamCarb molecular filters in AHUs, ducts and plenums.

Applicable filters: CamCarb Metal and CamCarb Green in 2600 and 3500 sizes. (Note always specific filter type when ordering as base plate thickness may vary to accommodate different weights of filters).

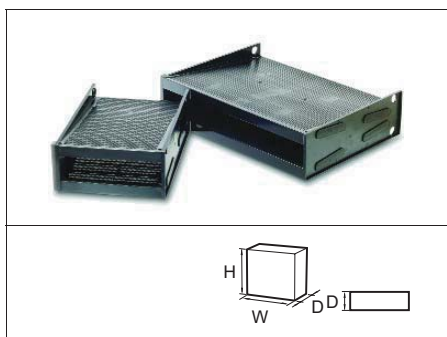
Material: Galvanised steel or stainless steel (specify with order)

Model	Width mm	Height mm	Depth mm	Cylinder capacity	Indicative weight kg	Approx. Unit volume m ³
G8	305	610	70	8	5.0	0.02
G12	457	610	70	12	5.7	0.03
G16	610	610	70	16	6	0.04



As part of our continuous improvement, Camfil reserve the right to change specifications without notice.

CamPure® GDM Green Disposable Modules



Advantages

- Completely incinerable
- Low pressure drop
- Various medias available dependent upon the contaminant(s) of concern
- Retrofit of existing installations

Description: Disposable plastic adsorber module designed to remove corrosive gases from industrial or commercial environments.

Typical application: Existing side-access housings or built up bank assemblies.

Efficiency: Media selection dependent, consult factory.

Adsorbent: "Broad Spectrum" activated carbon, adsorption of odours, ozone and organic gases. Impregnated activated carbon or campure impregnated alumina for adsorption of both organic and inorganic gases.

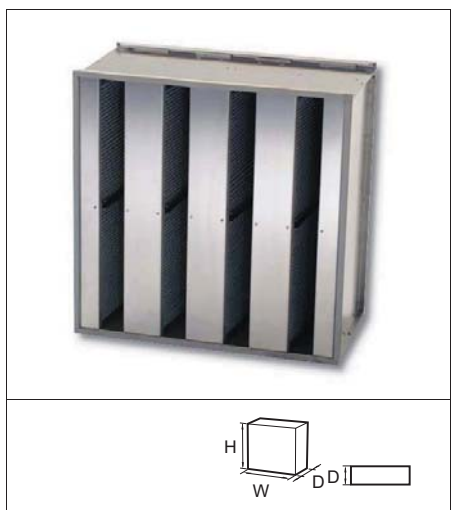
Temperature: Maximum continuous operating temperature of 50°C.

Recommended relative humidity: 30 - 90%.

Model	Dimensions (WxHxD) mm	Air flow / pressure drop m ³ /h/Pa	Media volume	Application
GDM 300F	600x295x300	425/75	27L	Make up air-handling units (MUA), recirculation air handling units, exhaust.
GDM 300H	300x295x300	212/75	13.5L	Make up air-handling units (MUA), recirculation air handling units, exhaust.
GDM 440F	600x145x440	700/50	13.5L	Make up air-handling units (MUA), recirculation air handling units, exhaust.
GDM 440H	300x145x440	350/50	6.75L	Make up air-handling units (MUA), recirculation air handling units, exhaust.

*Housings are available on request.

Gigapleat XPC/XPB



Advantages

- Reduced waste through re-usable housing
- Exchangeable panels
- Up to 2 media types can be combined into the same filter
- Compact solution
- High media cleanliness

Application: Clean room recirculation air and clean room make up air.

Type: Compact filter with exchangeable panels.

Housing: Stainless steel. Removable sheet metal profiles for panel replacement.

Gasket: Position: 01 - downstream, 10 - upstream.

Sealant: Polyurethane.

Configuration XPC: 2 layers of 8 panels / full size housing.

Configuration XPH: 1 layer of 8 panels / full size housing.

Recommended temperature range: 10 - 40°C.

Recommended relative humidity: 30 - 70%.

Particle cleanliness: ISO Class 6.

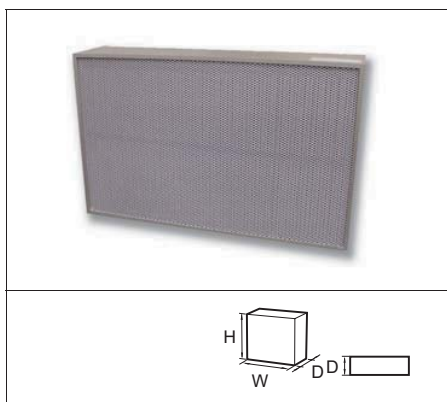
Outgassing: Individually outgassing tested for VOC emissions on request

Product	Type	Material	Width	Height	Depth	Number of panels per layer	Number of panels per housing	Appr. Weight with panels kg	Volume m ³
Box Housing	XPC 610x610x292	Stainless Steel	610	610	292	8	16	28	0,13
Box Housing	XPC 305x610x292	Stainless Steel	305	610	292	4	8	16	0,06
Header Housing	XPH 592x592x292	Stainless Steel	592	592	292	8	8	17	0,13
Header Housing	XPH 287x592x292	Stainless Steel	287	592	292	4	4	9	0,06

Panel	Fit Housing Width	Fit Housing Height	Fit Housing Depth	Air flow m ³ /h	Pressure drop Pa +/-15%
XPC A3	610/305	610	292	2600/1100	95
XPC B2	610/305	610	292	2600/1100	95
XPC C3	610/305	610	292	2600/1100	95
XPC L3	610/305	610	292	2600/1100	95
XPH A3	592/287	592	292	2600/1100	60
XPH B2	592/287	592	292	2600/1100	60
XPH C3	592/287	592	292	2600/1100	60
XPH L3	592/287	592	292	2600/1100	60

AMC removal vs filter model	L3	B2	A3	C3
Acids				YES
Bases		YES	YES	
Condensables (B.Pt > 150 deg. C)	YES		Yes	Yes
Dopants (Organophosphates)	YES		Yes	Yes
Dopants (BF3)				YES
Organics (B.Pt < 150 deg. C)	YES			
Ozone	YES		Yes	Yes
For specific contaminants, please contact Camfil				

Gigapleat NXPP



Advantages

- Extremely low pressure drop
- High media cleanliness
- Individually VOC outgassing tested
- Extremely small form factor
- Wide range of dimensions
- Multiple media types can be combined into the same filter

Application: For clean room ceiling, Fan Filter Units, mini-environment or process equipment.

Type: Panel filter.

Frame: Anodized aluminium.

Available filter depth without knife edge: 66, 90, 110, 150, 172 and 200 mm.

Available filter depth with knife edge: 66 (+38), 90 (+38), 110 (+38), 150 (+15) mm.

Knife: KU facing up, KD facing down.

Sealant: Polyurethane.

Gasket: 01=Downstream gasket, 10=Upstream, 11=2 gaskets.

Faceguard: 02: Downstream faceguard; 20: Upstream faceguard, 22: 2 faceguards.

Recommended temperature range: 10 - 40°C.

Recommended relative humidity: 30 - 70%.

Particle cleanliness: ISO Class 6.

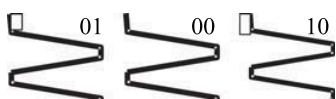
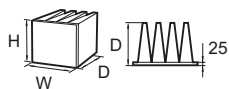
Outgassing: Individually outgassing tested for VOC emissions.

Type	Width	Height	Depth	Air flow m ³ /h	Pressure drop Pa +.15%	Appr. Weight kg	Volume m ³
NXPP A3	610	610	90	535	15	5	0,04
NXPP A3	1220	610	90	1070	15	10	0,04
NXPP B2	610	610	90	535	15	5	0,04
NXPP B2	1220	610	90	1070	15	10	0,04
NXPP C3	610	610	90	535	15	5	0,04
NXPP C3	1220	610	90	1070	15	10	0,04
NXPP L3	610	610	90	535	15	5	0,04
NXPP L3	1220	610	90	1070	15	10	0,04
NXPP B2C3L3	610	610	150	535	50	14	0,06
NXPP B2C3L3	1220	610	150	1070	50	28	0,06

Other dimensions and media combinations available on request. Adapter frames for FFU installation available on request.

AMC removal vs filter model	L3	B2	A3	C3
Acids				YES
Bases		YES	YES	
Condensables (B.Pt > 150 deg. C)	YES		Yes	Yes
Dopants (Organophosphates)	YES		Yes	Yes
Dopants (BF3)				YES
Organics (B.Pt < 150 deg. C)	YES			
Ozone	YES		Yes	Yes
For specific contaminants, please contact Camfil				

Gigapleat NXP



Advantages

- Low pressure drop
- High media cleanliness
- Low weight
- Incinerable

Application: Clean room recirculation air, clean room make up air.

Type: Compact filter with header.

Frame: ABS.

Sealant: Polyurethane.

Gasket: 01= downstream, 10 = upstream.

Recommended temperature range: 10 - 40°C.

Recommended relative humidity: 30 - 70%.

Particle cleanliness: ISO Class 6.

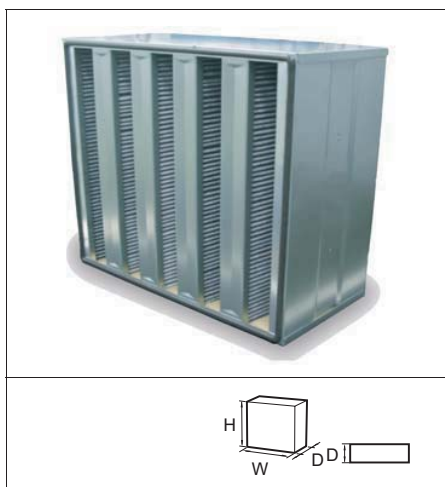
Outgassing: Individually outgassing tested for VOC emissions on request.

Type	Width	Height	Depth	Air flow m ³ /h	Pressure drop Pa +/-15%	Appr. Weight kg	Volume m ³
NXP A3	592	592	292	3300	60	12	0,13
NXP A3	592	287	292	1600	60	6,5	0,06
NXP B2	592	592	292	3300	50	12	0,13
NXP B2	592	287	292	1600	50	6,5	0,06
NXP C3	592	592	292	3300	60	12	0,13
NXP C3	592	287	292	1600	60	6,5	0,06
NXP L4	592	592	292	3300	60	12	0,13
NXP L4	592	287	292	1600	60	6,5	0,06

AMC removal vs filter model

	L3	B2	A3	C3
Acids				YES
Bases		YES	YES	
Condensables (B.Pt > 150 deg. C)	YES		Yes	Yes
Dopants (Organophosphates)	YES		Yes	Yes
Dopants (BF ₃)				YES
Organics (B.Pt < 150 deg. C)	YES			
Ozone	YES		Yes	Yes
For specific contaminants, please contact Camfil				

Gigapleat NXPC



Advantages

- Low pressure drop
- High media cleanliness
- Wide range of dimensions

Application: Clean room recirculation air, clean room make up air.

Type: Compact filter.

Frame: GI, aluminium or stainless steel.

Sealant: Polyurethane.

Gasket: 01 = downstream, 10 = upstream.

Recommended temperature range: 10 - 40°C.

Recommended relative humidity: 30 - 70%.

Particle cleanliness: ISO Class 6.

Outgassing: Individually outgassing tested for VOC emissions on request

Type	Width	Height	Depth	Air flow m ³ /h	Pressure drop Pa +-15%	Appr. Weight kg	Volume m ³
NXPC A3	610	610	292	2600	60	15	0,13
NXPC A3	305	610	292	1100	60	8	0,06
NXPC A3	595	595	292	2600	60	15	0,13
NXPC A3	289	595	292	1100	60	8	0,06
NXPC A3	592	592	292	2600	60	15	0,13
NXPC A3	287	592	292	1100	60	8	0,06
NXPC B2	610	610	292	2600	60	15	0,13
NXPC B2	305	610	292	1100	60	8	0,06
NXPC B2	595	595	292	2600	60	15	0,13
NXPC B2	289	595	292	1100	60	8	0,06
NXPC B2	592	592	292	2600	60	15	0,13
NXPC B2	287	592	292	1100	60	8	0,06
NXPC C3	610	610	292	2600	60	15	0,13
NXPC C3	305	610	292	1100	60	8	0,06
NXPC C3	595	595	292	2600	60	15	0,13
NXPC C3	289	595	292	1100	60	8	0,06
NXPC C3	592	592	292	2600	60	15	0,13
NXPC C3	287	592	292	1100	60	8	0,06
NXPC L3	610	610	292	2600	60	15	0,13
NXPC L3	305	610	292	1100	60	8	0,06
NXPC L3	595	595	292	2600	60	15	0,13
NXPC L3	289	595	292	1100	60	8	0,06
NXPC L3	592	592	292	2600	60	15	0,13
NXPC L3	287	592	292	1100	60	8	0,06

For media choice, please refer to Gigapleat NXPH