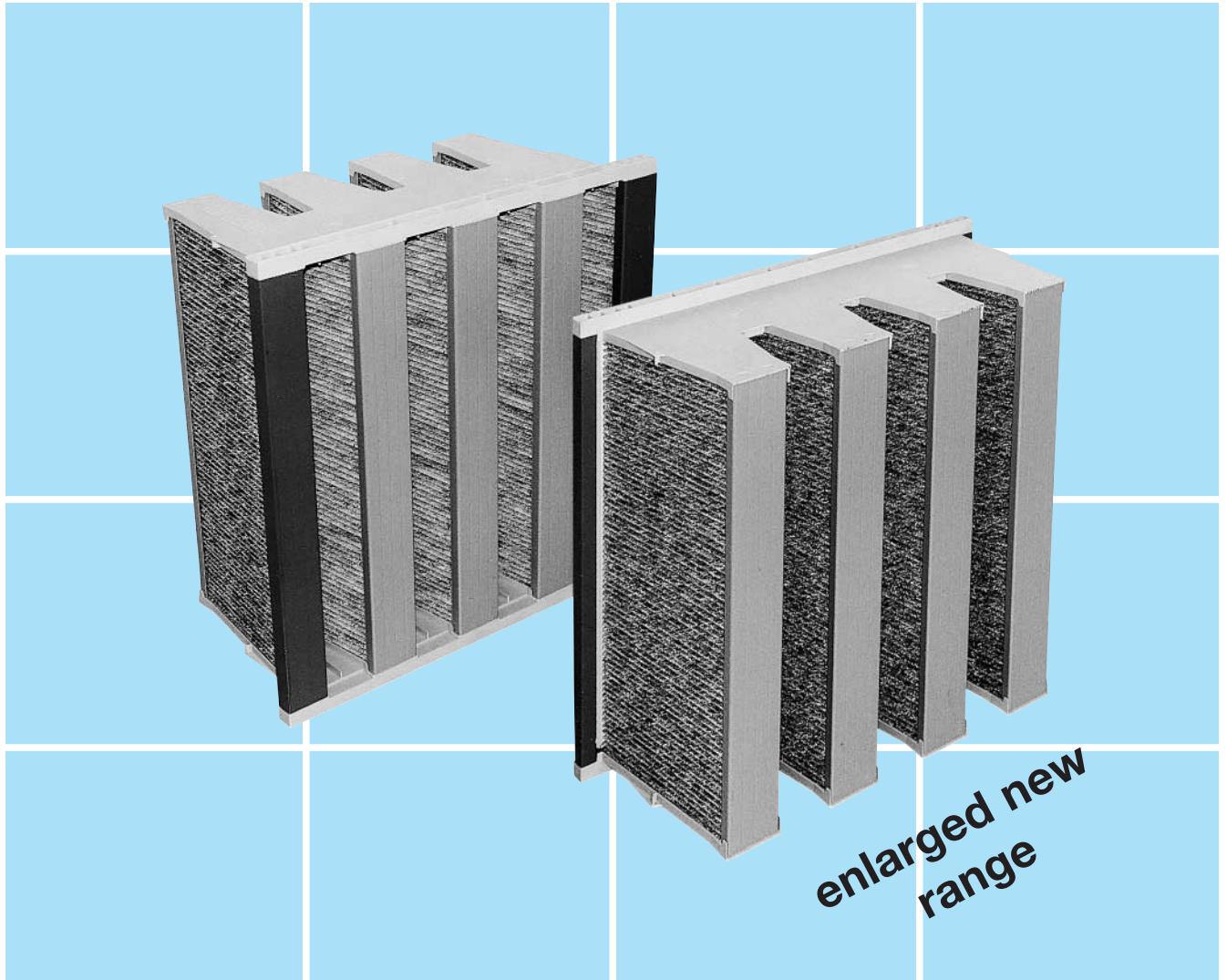


Luwa AFP Gas Adsorption Filters



To reduce airborne molecular contamination, in Clean Rooms, unpleasant odors, VOC's, anthropogenes

- High contamination removal efficiency – even for ppb concentration levels
- Low pressure drop – saves energy – retrofits possible
- Media options for specific removal of amines and acids
- No dust release – near zero out-gassing – no discharge of adsorbed gases
- Also effective as particle filter
- Fits ordinary fine dust filter frame systems
- Light weight – easy to handle
- Throw away unit – no medium replacement
- Problem free disposal by incineration

Luwa

Luwa AFP-Filters – the new approach to gas phase filtration

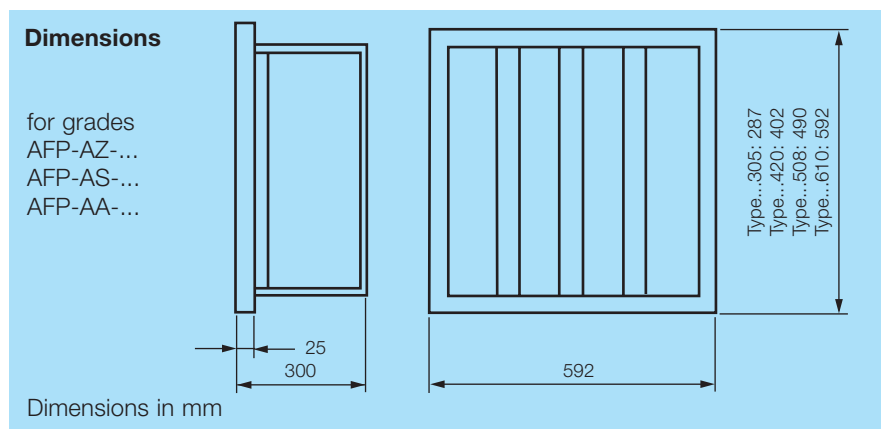
It is becoming more and more important to remove airborne molecular contamination (AMC) from air, used for general ventilation and for critical production processes in Clean Rooms. Whilst particulate removal has been the priority in the past, the elimination of AMC has become the focus for future improvements of indoor air quality (IAQ) or process environments. Various gases can be controlled using the three different grades (AZ, AS and AA) of the comprehensive range of Luwa AFP filters. For examples of contaminants, that may be of concern in your specific application, please refer to pages 3 to 5.

Application in HVAC

The Luwa AFP gas adsorption filters are an excellent low cost method for removing odors and improving IAQ in air conditioned buildings – an important contribution to the cure of “sick building syndrome” (SBS). Luwa AFP filters are designed for those cases in which the gas concentrations are relatively low. Such contaminations may cause unpleasant physical reactions of the occupants, e.g. headaches, nausea, but would not be life threatening.

Application in microelectronics industry and Clean Room technology

In addition to chemically filtering external make-up air for the removal of environment-based VOC, SO_x and NO_x type contaminants, it is important to account for chemical contaminants created within the facility as well. Outgassing of building materials as well as chemical processes inside the production facility – including photographic operations, acid etching, and cleaning/drying – may produce dangerous and yield reducing levels of alkaline, acidic, sulfuric and organic gases. The Luwa AFP gas adsorption filters are a low energy consuming method for achieving “clean” process air environments in semiconductor manufacturing and other critical applications. They are designed for those cases in which the gas concentrations are relatively low.



Design

Luwa AFP filters are a new generation of gas adsorption filters in a rigid cellular 4-V-design with pleated filter media and a header frame. They are fitted with a revolutionary new filter medium in which very small adsorbent particles are evenly suspended and bonded to the three dimensional network of synthetic fibres. This way, the adsorbent is brought in close contact with the air stream to be cleaned – without glue, without perforated plates, without dust emissions and without leaks from the settlements of granular carbon beds. Compared to conventional filters, the AFP design offers lowest pressure drop, high specific adsorption capacities, perfect adsorbent usage and a low filter weight. The excellent adsorption efficiency and capacity and the low pressure drop have been carefully proven in the laboratories of Luwa, of other institutions and in field measurements. As our own and independent measurements^[1] have proved, gas molecules in low concentrations are preferentially adsorbed on the surface of activated carbon granules. Consequently, the cores of the conventional, coarse activated carbon granules remain partly unused in the short contact time during the passage of the gases and are ineffective. The new Luwa AFP gas adsorption filters contain therefore a filter medium with extremely small and highly activated carbon particles.

Application limits

Max. operating temperature ^[2]	< 50 °C
Recommended operating temperature	< 30 °C
Maximum relative humidity ^[2]	< 80 %
Recommended relative humidity	
– AFP-AZ	< 60 %
– AFP-AS ^[2]	> 40 %
Minimum prefiltration ^[3]	> F6
Recommended prefiltration ^[3]	F9

Materials

- Frame: Recyclable, incinerable, halogen free Polystyrol
- Filter medium: Synthetic fibre filter medium with various types of adsorbents (see pages 3 to 5).
- Sealant: Polyurethane

Installation

Luwa AFP gas adsorption filters can be installed easily in standard type “F” fine dust filter frames (see Luwa leaflet No. 42.18.01). Luwa Type F-frames can be combined at will and installed into ducts, air conditioning units and wall openings.

Disposal

AFP filters, soiled by exterior AMC can be disposed of in the same way as normal industrial refuse (e.g. incineration/land-filling). Filters soiled by toxic and/or radioactive AMC must be disposed of as **hazardous waste** in accordance with local regulations.

Remarks

- [1] Respirator cartridge efficiency studies VI, Nelson/Harder, Lawrence Livermore Laboratory, CA, USA
- [2] Ignoring this condition causes an efficiency reduction. Ignoring more than one condition would cause significant loss of performance.
- [3] Particle prefilters for the AFP filters significantly prolong its life and are strongly recommended (see Luwa leaflets No. 42.11.01 and 42.12.01)
- [4] The adsorption capacity “A” represents the filter life “T” in hours for an inlet concentration “C” in ppb, from initial down to a minimum efficiency: $A = C \cdot T$ and: $T = A/C$

Luwa AFP-AZ – for the removal of VOC's and other AMC's

Luwa AFP-AZ

Filters with highly activated, unimpregnated micro granular coconut shell based activated carbon, offering full physisorption capacity and a wide application range.

Typical Applications:

- Microelectronic industry
- Airports
- Hotels, Restaurants
- Office buildings
- Museums, Libraries
- Hospitals

Technical data	AFP-	AZ-305	AZ-420	AZ-508	AZ-610
Max. air flow \dot{V}_M (short service life)	m ³ /h	1700	2300	2700	3400
Pressure drop at \dot{V}_M	Pa	70	70	65	65
Rated air flow \dot{V}_R (long service life)	m ³ /h	850	1150	1350	1700
Pressure drop at \dot{V}_R	Pa	25	25	20	20
Total weight of filter	kg	4.3	5.6	6.8	7.6
Activated carbon net weight	kg	2.2	3.3	3.9	4.8
Filter medium area	m ²	4.7	7.1	8.4	10.3
Adsorpt. capacity ⁴⁾ at \dot{V}_R for Toluene*	ppb·h	43'135	62'977	78'161	95'760
Initial efficiency at \dot{V}_R for Toluene	%	97	97	97	97

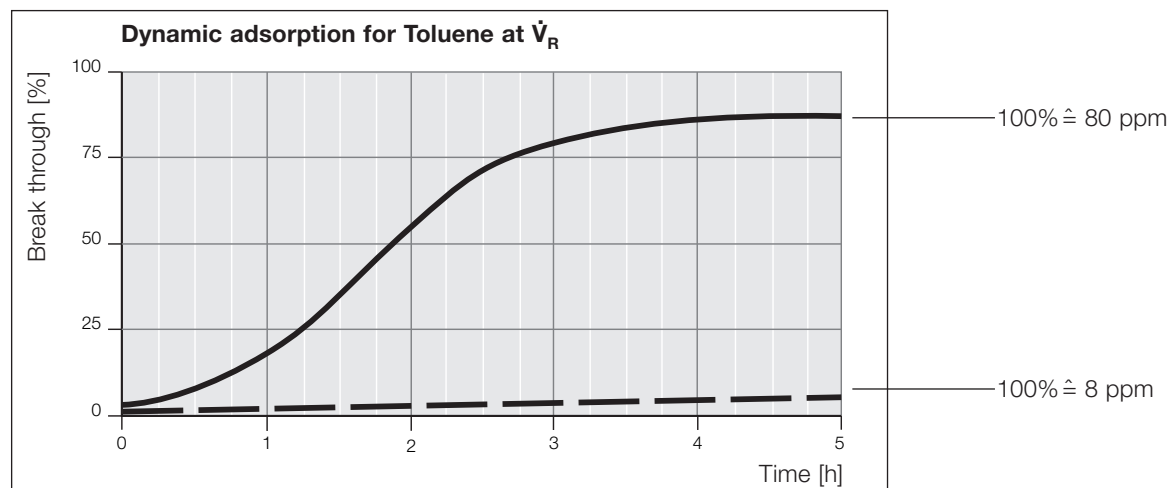
⁴⁾down to 70% efficiency at 23 °C and 50% relative humidity

Luwa AFP-AZ filters are particularly effective against:

- Hydrocarbons (HC's) or volatile organic compounds (VOC's)
- Condensables (DOP, BHT, Siloxane)
- Smog, ozone, etc. (the so called antropogenes)
- Combustion and diesel gases
- Asphalt, tar, petrol, kerosene and other fuel vapours
- Solvent and thinner vapours from paint and varnish
- Glue, rubber or cleaning agent vapours
- General personnel, cosmetic and tobacco smoke odors
- Hospital, alcohol and antiseptics odors
- Cooking, food and decaying food odors
- Many other gaseous contaminants

Luwa AFP-AZB

These gas filters are designed for the same applications, and to remove the same spectrum of gases but they offer a significant longer service live. Further information is contained in Luwa leaflet No. 48.11.01.



Luwa AFP-AS – for the removal of acidic AMC's

Luwa AFP-AS

Filters with two micro granular highly activated and specifically impregnated carbon types in a unique dual layer arrangement for chemisorption of a wide range of acidic and corrosive gases.

Typical Application:

- Microelectronic industry
- Airports (control rooms)
- Museums, Libraries
- Industry (control rooms)

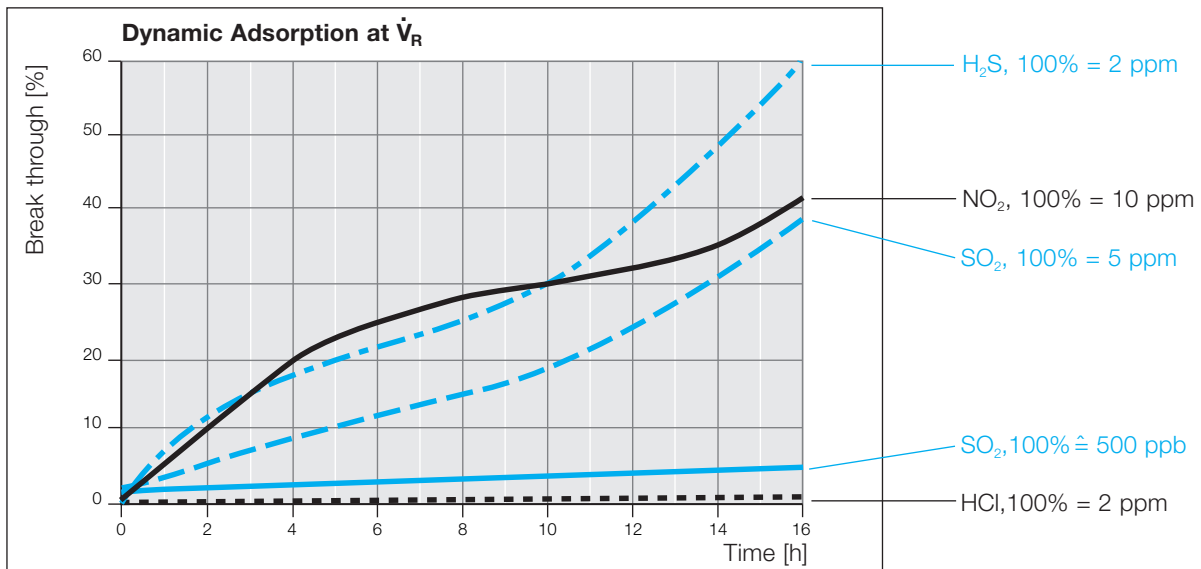
Luwa AFP-AS filters are particularly effective against acidic gases, e.g.:

- Nitrogen oxides (NO₂, NO_x, HNO_x)
- Sulphur oxides (SO₂, SO₄)
- Hydrogene sulfide (H₂S)
- Sulfuric acid (H₂SO₄)
- Hydrochlorid acid (HCl)
- Fluoric acid (HF)
- Chlorine (Cl₂)

Technical data	AFP-	AS-305	AS-420	AS-508	AS-610
Max. air flow \dot{V}_M (short service life)	m ³ /h	1700	2300	2700	3400
Pressure drop at \dot{V}_M	Pa	70	70	65	65
Rated air flow \dot{V}_R (long service life)	m ³ /h	850	1150	1350	1700
Pressure drop at \dot{V}_R	Pa	25	25	20	20
Total weight of filter	kg	4.3	5.6	6.8	7.6
Activated carbon net weight	kg	2.2	3.3	3.9	4.8
Filter medium area	m ²	4.7	7.1	8.4	10.3
Adsorption capacity ⁽⁴⁾ at \dot{V}_R for SO ₂ *	ppb·h	28'176	41'136	51'054	62'550
Initial efficiency at \dot{V}_R for SO ₂	%	97	97	97	97
Adsorption capacity ⁽⁴⁾ at \dot{V}_R for H ₂ S*	ppb·h	8'108	11'838	14'692	18'000
Initial efficiency at \dot{V}_R for H ₂ S	%	>99	>99	>99	>99
Adsorption capacity ⁽⁴⁾ at \dot{V}_R for NO ₂ *	ppb·h	40'541	59'189	73'459	90'000
Initial efficiency at \dot{V}_R for NO ₂	%	>99	>99	>99	>99
Adsorption capacity ⁽⁴⁾ at \dot{V}_R for HCl**	ppb·h	36'036	52'613	65'297	80'000
Initial efficiency at \dot{V}_R for HCl	%	>99	>99	>99	>99

* down to 70% efficiency at 23 °C and 50% relative humidity

** down to 90% efficiency at 23 °C and 50% relative humidity



Luwa AFP-AA – for the removal of alkaline AMC's

Luwa AFP-AA

Filters with a functionalised micro-granular polymer to adsorb amines through ion exchange, combined with a final layer of highly activated and specifically impregnated microgranular carbon for the chemisorption of acidic by-products.

Typical Application:

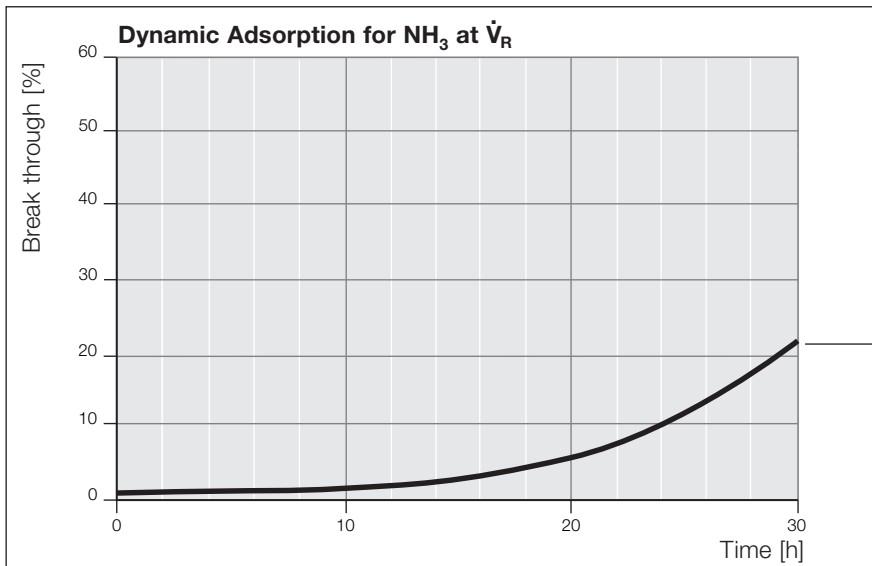
- Microelectronic industry
- Other industries

Luwa AFP-AA filters are particularly effective against alkaline gase, e.g.:

- Bases
- Amines
- Ammonia (NH₃, NH₄)
- NMP, HMDS

Technical data	AFP-	AA-305	AA-420	AA-508	AA-610
Max. air flow \dot{V}_M (short service life)	m ³ /h	1700	2300	2700	3400
Pressure drop at \dot{V}_M	Pa	70	70	65	65
Rated air flow \dot{V}_R (long service life)	m ³ /h	850	1150	1350	1700
Pressure drop at \dot{V}_R	Pa	30	30	25	25
Total weight of filter	kg	4.3	5.6	6.8	7.6
Net weight of adsorbant	kg	2.4	3.7	4.3	5.4
Filter medium area	m ²	4.7	7.1	8.4	10.3
Adsorption capacity ⁴⁾ at \dot{V}_R for NH ₃ **	ppb·h	67'374	98'367	122'082	149'571
Initial efficiency at \dot{V}_R for NH ₃	%	99	99	99	99

*down to 70% efficiency at 23 °C and 50% relative humidity



This documentation is regularly checked for correctness and validity, and can be subject to change at any time without separate notification.

