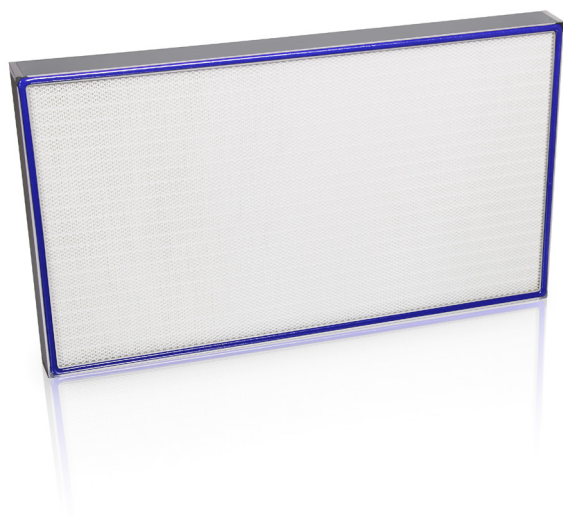




HS-Mikro SF-AL are high efficient HEPA and ULPA filters for submicron particle filtration (>20 nm). The filters are outfitted with sturdy extruded anodized aluminium profile frames which makes them corrosion resistant and due to the low weight allows easy handling. The filters are designed to work most efficiently in environments that require the highest cleanliness, such as in pharmaceutical, medical, electric, or nanotechnology industries. Such environment require a secure removal of dust, particles, microorganisms and viruses from supply air as a basic requirement for their function.

Clean room technologies aim to control the air inside facilities by removing dust and micro-organisms and leading it to selected work places or operation rooms. HS-Mikro-SF AL are designed to serve as main filter stage for terminal filtration in filter ceilings, filter walls, clean benches, isolators, work cabins, air showers and air passages that require beside pure air a laminar air flow.



Designing HEPA filter and fine dust filters large flows, high dustloads loads or to perform with the best energy efficiency requires an uncompromising quality of the pleat geometry . Fine-dust, EPA, HEPA and ULPA Filter made by HS-Luftfilterbau always offer optimal filtersurface usage thanks to our technically advanced production methods, allowing perfectly straight folds up to 250 mm fold depths.

Our technologically advanced factory and strict quality regulations guarantees close limits of product variation and an unmatched quality level. Our flexible, order-related production ensures the production of all standard and odd sizes - no matter whether it is a single piece production or full scale JIT-Framework order). We supply the whole range of EN 1822 filter-classes from E10 to U16 (Class U17 upon request).

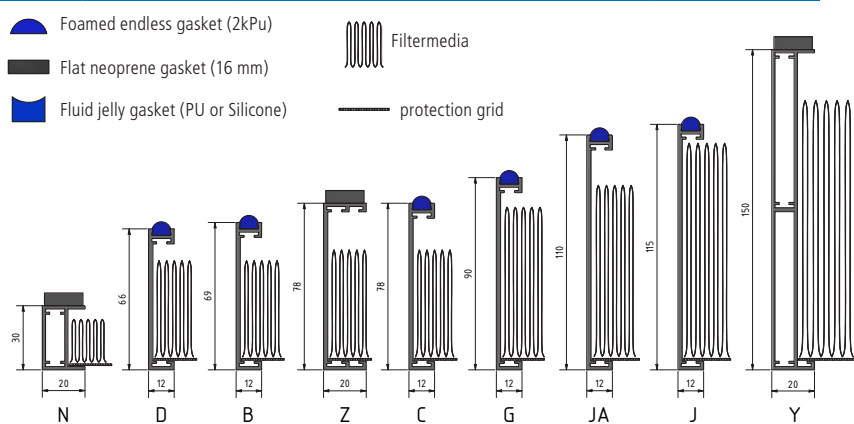
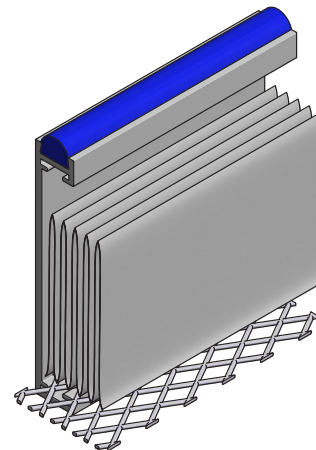


The filterframes are made from anodized, extruded aluminium profiles. The surface quality conforms class "B" according to EN 573-3. There are various profiles available. Beside our standard frames (Type B, Z, C, G, J, L, R and K) we offer diverse frame profiles for customer specific applications. The filter performance can be defined by the customer or process demands. The service lifetime, initial pressure drop and energy consumption can be adjusted to your demand by the different fold geometries we offer.

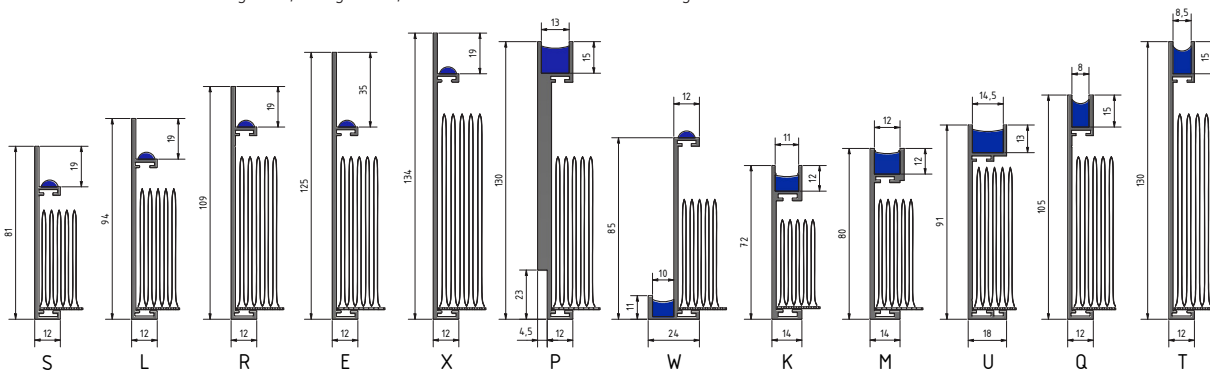
Filters using standard profiles have quite short lead times. For all non standard profiles the lead times may vary with the current stock availability of the profiles.

| Type   | Height [mm] | std. fold height [mm] | opt. fold heights [mm] | Standard profile |
|--------|-------------|-----------------------|------------------------|------------------|
| N      | 30          | 25                    | 15, 20, 25             | ✓                |
| D      | 66          | 45                    | 34, 45                 | ✓                |
| B      | 69          | 45                    | 34, 45, 50             | ✓                |
| Z      | 78          | 55                    | 45, 50, 55, (65)       | ✓                |
| C / M  | 78 / 80     | 55                    | 45, 50, 55, (-/65)     | ✓                |
| G      | 90          | 70                    | 45, 50, 65, 80         | ✓                |
| JA / J | 115         | 100                   | 65, 80, 100            | ✓                |
| Y      | 150         | 120                   | 80, 120                | ✓                |
| S      | 81          | 55                    | 34, 50, 55             | –                |
| L      | 94          | 55                    | 45, 50, 55, 65         | ✓                |
| E / R  | 109 / 125   | 65                    | 45, 50, 55, 65         | – / ✓            |
| X      | 134         | 65                    | 55, 65, 80             | –                |
| W      | 85          | 50                    | 34, 45, 65             | –                |
| K      | 72          | 45                    | 34, 50                 | ✓                |
| U      | 91          | 55                    | 45, 50                 | –                |
| P / T  | 130         | 80                    | 55, 65, 100            | – / ✓            |

Cross section of the filter construction:



Profiles for ceiling filters, ceiling outlets, clean benches and duct-channel housings



Profiles for FFU's (fan filter units) and clean room ceilings

The diagram shows our most usual profiles, fitted with the most common standards in reference to the position of the protection grid, type and location of the gasket. The height of the filtermedia is not true to scale. Upon request we can offer more special profiles. Please contact our engineers .

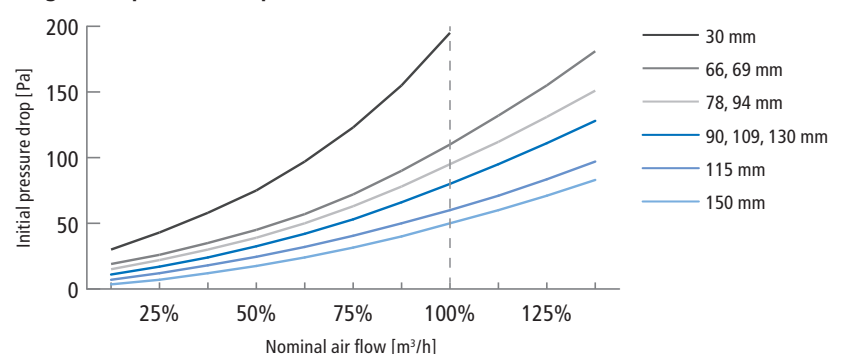
| Class EN 1822                 | Profile Type | E11  | H13    | H14     | U15      | U16       | H14 PTFE     | U15 PTFE | U16 PTFE  |
|-------------------------------|--------------|------|--------|---------|----------|-----------|--------------|----------|-----------|
| Efficiency EN 1822 @ MPPS [%] |              | >98  | >99,95 | >99,995 | >99,9995 | >99,99995 | >99,995      | >99,9995 | >99,99995 |
| Nominal air flow [m/s]        |              | 0,45 | 0,45   | 0,45    | 0,45     | 0,45      | 0,45         | 0,45     | 0,45      |
| Initial-ΔP [Pa] T=30mm        | N            | 100  | 145    | 195     | -        | -         | 75           | 85       | 100       |
| Initial-ΔP [Pa] T= 66/69 mm   | D / B        | 55   | 95     | 110     | 130      | -         | 50           | 60       | 80        |
| Initial-ΔP [Pa] T=78 mm       | Z / C        | 40   | 80     | 95      | 115      | 140       | 45           | 55       | 70        |
| Initial-ΔP [Pa] T=90 mm       | G            | 35   | 65     | 80      | 100      | 120       | 20           | 35       | 55        |
| Initial-ΔP [Pa] T=94 mm       | L            | 40   | 80     | 95      | 115      | 140       | 45           | 55       | 70        |
| Initial-ΔP [Pa] T=109 mm      | R            | 35   | 65     | 80      | 100      | 120       | 20           | 35       | 55        |
| Initial-ΔP [Pa] T=115 mm      | J            | 30   | 45     | 60      | 75       | 90        | <20          | 25       | 45        |
| Initial-ΔP [Pa] T=134 mm      | X            | 35   | 65     | 80      | 100      | 120       | 20           | 35       | 55        |
| Initial-ΔP [Pa] T=150mm       | Y            | 25   | 45     | 50      | 70       | 85        | upon request |          |           |

The given initial pressure drop is valid for filters with a single side protection grid on the air leaving side. Filters with protection grids on both sides may have higher values. Our flexible production is able to realize nearly any demand / specification.

Filters fulfilling class EN 1822 U17 will only be offered as customized product. The pressure drop underlies tolerances. Please contact our sales engineers for tolerances, further dimensions or options.

| Dimension [mm] |        | Nominal air flow [m³/h] | Dimension [mm] |        | Nominal air flow [m³/h] |
|----------------|--------|-------------------------|----------------|--------|-------------------------|
| Width          | Height |                         | Width          | Height |                         |
| 305            | 305    | 150                     | 762            | 762    | 940                     |
| 457            | 457    | 340                     | 915            | 762    | 1130                    |
| 305            | 610    | 300                     | 1220           | 762    | 1505                    |
| 610            | 610    | 605                     | 1525           | 762    | 1880                    |
| 762            | 610    | 755                     | 1830           | 762    | 2260                    |
| 915            | 610    | 905                     | 915            | 915    | 1355                    |
| 1220           | 610    | 1205                    | 1220           | 915    | 1805                    |
| 1525           | 610    | 1505                    | 1525           | 915    | 2260                    |
| 1830           | 610    | 1810                    | 1830           | 915    | 2710                    |

Diagram of pressure drop EN 1822 H14



The validity of the diagram to the right is limited to filters with class EN 1822 H14, glass fibre, single side protection grid and standard pleat depth (filtersurface).

#### Operational conditions

- max. rel. h. 100 [%]
- max. temp. 65 [°C]  
optional bis max. 120 [°C] (glass media only)
- pressure drop may temporarily increase at high humidity levels

## Optional: Terminal Filter / Hooded Filter

We offer HS-Mikro SF-AL also as terminal filter. The design allows the connection of the filter to supply lines, ducting and hoses. For this the HS-Mikro SF-AL is mounted by a hood made from steel (either galvanized, painted or stainless) or aluminium on the filter frame. The hood is applied to the filter by special adhering sealing compounds. The tightness of the hood is approved during the EN 1822-4 testing. Optionally the hood can be fitted with damper flaps to allow a precise setting of the air speed through the filter. Also we can fit connections pins for measuring the pressure drop or to apply aerosols for in-situ testing of the filter efficiency.

The dimension of the hood and the spigot are manufactured according to the process- or customer requirements.



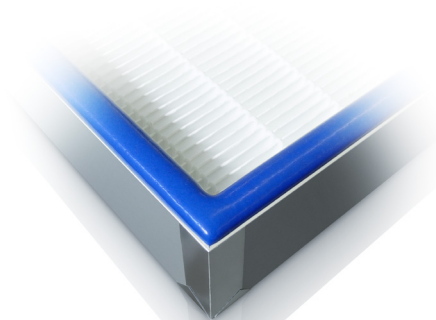
|                      |                      |                               |
|----------------------|----------------------|-------------------------------|
| Example applications | ▪ Clean room ceiling | ▪ Clean benches               |
|                      | ▪ Isolators          | ▪ Fan-Filter-Units (FFU's)    |
|                      | ▪ Micro-Environment  | ▪ Air Showers                 |
|                      | ▪ Clean room airlock | ▪ Last barrier safety filters |
|                      | ▪ Terminal filter    |                               |

By standard HS-Mikro SF-AL are fitted with a protection grid on the clean air side. We optionally fit the filters with grids on both sides - or no grid at all to reduce the pressure drop. You can choose between three different protection grids

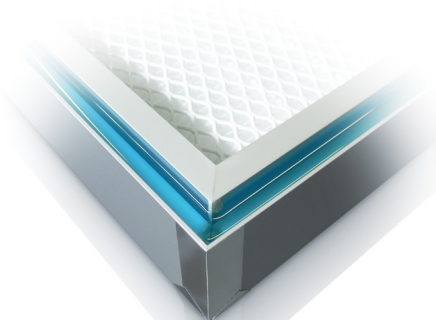
|                                    |                                                                                                                                                                                                                                                                                      |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Powder coated aluminium [standard] | This protection grid is our standard. We exclusively use powder coated aluminium to ensure maximum corrosion resistance.                                                                                                                                                             |
| Polypropylen                       | Filters with dimensions of up to 610x610 mm may be fitted with this more cost effective alternative made from semi-transparent polypropylene. Thanks to the slightly wider mesh size this type of grid offers a lower pressure drop and thus contributes to energy efficient design. |
| Aluminium blank                    | This type of grid is needed for filters with antistatic features. Such filters that are fitted with a special version of NON-ANDROZIED profiles and are equipped with antistatic features for ATEX.                                                                                  |

## HS-Mikro SF -AL can be fitted with various gaskets for different applications

|                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Endless foamed polyurethane gasket      | This seamless and closed-cell gasket is directly foamed on the frame as a single piece. It consists of two component polyurethane. The height of the gasket guided by a groove (i.e. profiles D, B, C, G, J) appx. 3 mm. For profiles without groove the height ist 6 mm. HS-Mikro SF-AL are fitted by standard with a foamed gasket on the air entry side. Beside this, most profiles can be fitted with gaskets on both sides                                   |
| Gel jelly gasket polyurethane           | The profile types K, U, Q, and T are supplied with gel gaskets. By default this gel is made of polyurethane (blue-transparent). This gel type is guaranteed to be bubble-free to avoid any potential gas-exchange with the environment. Of course our gel-gasket is free from harmful plasticizers (phtalate free) and is fully REACH conform.                                                                                                                    |
| Gel jelly gasket silicone               | The above listed profiles can be fitted with an alternative silicone gel (clear-transparent) on demand. This gel offers a slightly higher fluidity and is heat tolerant up to 160°C.                                                                                                                                                                                                                                                                              |
| Flat gasket neoprene (Standard) or PTFE | The profiles N, Y and Z can optionally be fitted with a flat section gasket. This gasket is beneficial in applications where the filter is installed in ceiling outlets or mounting systems that offer a bypass-leak test according to DIN 1946-4 (1998) or KTA 3601. If a leak test grove is given in the mounting system we recommend to ensure that the filters are installed in a centered position before fixation to avoid damaging the gasket by shearing. |



We're sealing the profile gear cuts with tape to exclude the very small risk of a particle diffusion through the gear cut seam.



100% free of any bubbles:  
our plasticizer free PU-GEL gasket



HS-Mikro SF-AL Filter with ePTFE membrane and PU-jelly gasket.



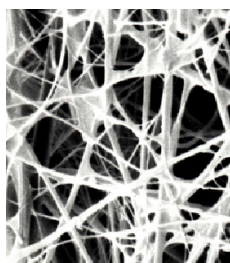
## Filtermedia

There are different filtermedia available for this filtertype.

Unless the process requirements do not demand something special, we offer high quality micro-glassfibre filterpaper with different efficiency grades as the standard filter media. The medias structure and composition fulfills the requirements for temperature and moisture. In case of boron sensitive processes we recommend to low-boron filter media also based on glass fibres. Boron can be emitted by usual filtermedia in molecular traces and may cause negative effects at some technical processes (i.e. microelectronics). We recommend the use of ePTFE membranes for applications that have highest demands for mechanical integrity or where boron must be excluded at all. Such membranes are very resilient and completely unaffected by moisture and chemicals that may harm glass media. Even highest filter efficiencies up to class U17 can be realized with ePTFE in much smaller dimensions than with usual glass media.

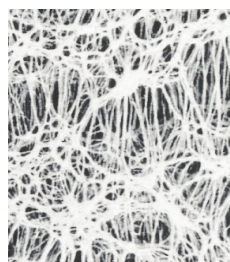
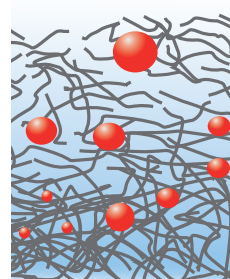
The filtermedia is pleated in close folds and thermoplastic spacers ensure a high mechanical stability and precise distance of the folds. This ensures an optimal laminar air flow.

Regular ePTFE Membranes are sensitive against oil mists and aerosols so we strongly recommend to avoid the usage of test-aerosols like DEHS, DOP or PAO while performing on site tests (i.e. ISO 14644). We advise to use PSL particles with a size spectrum of 0,1 - 0,2 µm. Alternatively we can offer special ePTFE Membranes that are **fully resistant against oily aerosols** used during qualification tests. Please inform our sales when asking for quotations.



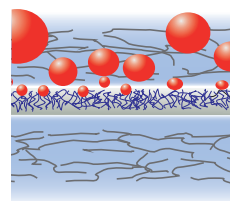
### Glasfibre

Glass fibre media provide a 3D fiber structure with limited progressive filter structure. Advantage: good dust holding capacity, since particles can penetrate deep into the media structure. Even at higher particle load a good service lifetime can be achieved.



### ePTFE Membranes

ePTFE membranes are usually surrounded by protective coatings with high penetration levels. The filter mechanism is highly surface-related. This allows a low pressure drop but makes the usual membrane filter sensitive to oily aerosols and high particle concentrations. A good pre-filtration is recommended. We can supply oil-resistant Membranes when required.



| Characteristic                     | Glass fibre media                 | ePTFE media                                      |
|------------------------------------|-----------------------------------|--------------------------------------------------|
| Filterclass @ 0,45 m/s             | E11 - U16                         | H13 - U17                                        |
| Moisture resistance                | up to 100% rel. h.                | up to 100% rel. h.                               |
| ▪ Tear resistance                  | 100%                              | >800%                                            |
| ▪ Tear resistance @ 100% rel. H.   | 10 -20%                           | >800%                                            |
| Boron emitting                     | Yes                               | No                                               |
| Chemical resistance:               |                                   |                                                  |
| ▪ Oil-mist                         | good                              | very poor (optionally <b>good</b> ) <sup>1</sup> |
| ▪ Hydrogen peroxide                | good                              | good                                             |
| ▪ Hydrofluoric acid                | very poor                         | good                                             |
| ▪ Formaldehyde                     | good                              | good                                             |
| ▪ Acetone                          | good                              | good                                             |
| ▪ Hydrochloric acid                | poor                              | good                                             |
| ▪ Toluol, Hexan, Xylen             | good                              | poor                                             |
| ▪ Isopropanol                      | good                              | good                                             |
| Testaerosol acc. EN 1822           | DEHS 0,1- 0,3 µm<br>(oil / fluid) | PSL 0,15 µm<br>(monodisperse solid)              |
| Initial-ΔP(acc. to product design) | 40 - 350 Pa                       | 15 - 200 Pa                                      |

<sup>1</sup>) Valid only for qualifying and In-Situ tests. We don't recommend ePTFE for oil mist filtration.

## Individual testing of HEPA- and ULPA-Filters

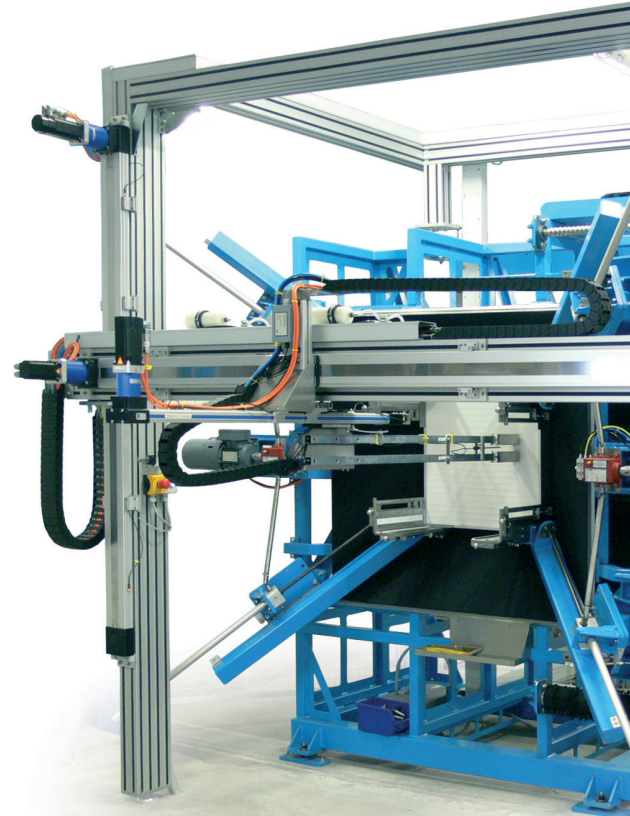
Each of our HEPA- and ULPA-filter will be tested in compliance with EN 1822 categorically. Every test is documented thoroughly. All the components used in our filters can be traced due to individual serial numbers. For this task HS-Luftfilterbau GmbH operates one of the most advanced test laboratories.

The Filters are efficiency tested by scanning with optical particle lasercounters for the local and integral efficiency against MPPS particle size (ranging from 0,1 - 0,3µm). Glass fibre media filters are tested with DEHS (Di-Ethy-Hexyl-Sebacat) whilst ePTFE membrane filters are solemnly tested with monodispersal solid aerosol (PSL). The maximum size we can scantest is 1830x1220 x 400 mm.

Optionally, you may ask for a test report of the obligatory oil fog test or an extensive scan test starting with class EN 1822 H13. We conduct scan tests for clean room panel filters as well as HEPA-filter that will be applied within pharmaceutical or demanding industrial environments. For any filters of class EN 1822:U15 or higher scantesting is mandatory.

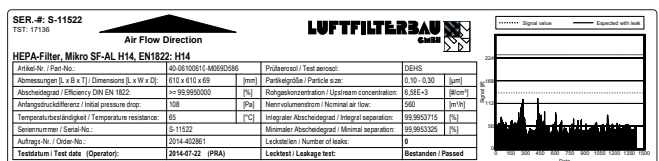
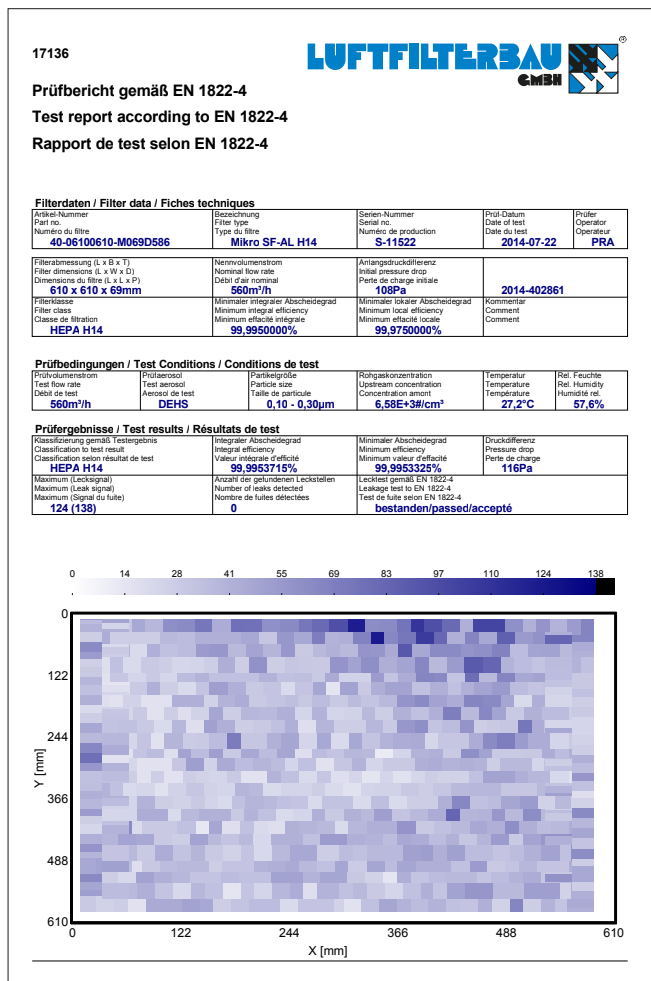
According to the demand of our customers we can tighten single test parameters like the leak detection value far stricter than the tolerances allowed by EN 1822. Upon request we can issue the resulting test report completely neutral (no company logo) or with your companies brand (OEM).

The surface scantest results are accurately recorded and will be displayed to scale in a easy to understand 2-D diagram. Also, a diagram with the complete measuring data will be present on the product label as a proof for a successful test and individual watermark. This allows a much better traceability of the test results by the end user if compared to usual test reports of other brands. When required we can perform air-flow-uniformity test as an additional test. The test is performed by measuring the air speed on a pre-defined grid of measuring points. By graphical diagram we can prove that the velocity variation is within your specification limit and thereby guarantee that the flow field is not exceeding your individual tolerance.



Upper-right:  
Our testrig is designed to meet all requirements of EN 1822. Our exclusive measuring equipment ensures isocinetic probing - even at variable air flows.

Left:  
The test report is generated by the test rig and contains all measured data. The test data are visualized by a 3D diagram.



The product label is automatically generated by the test system and contains the whole test data incl. a test diagram.