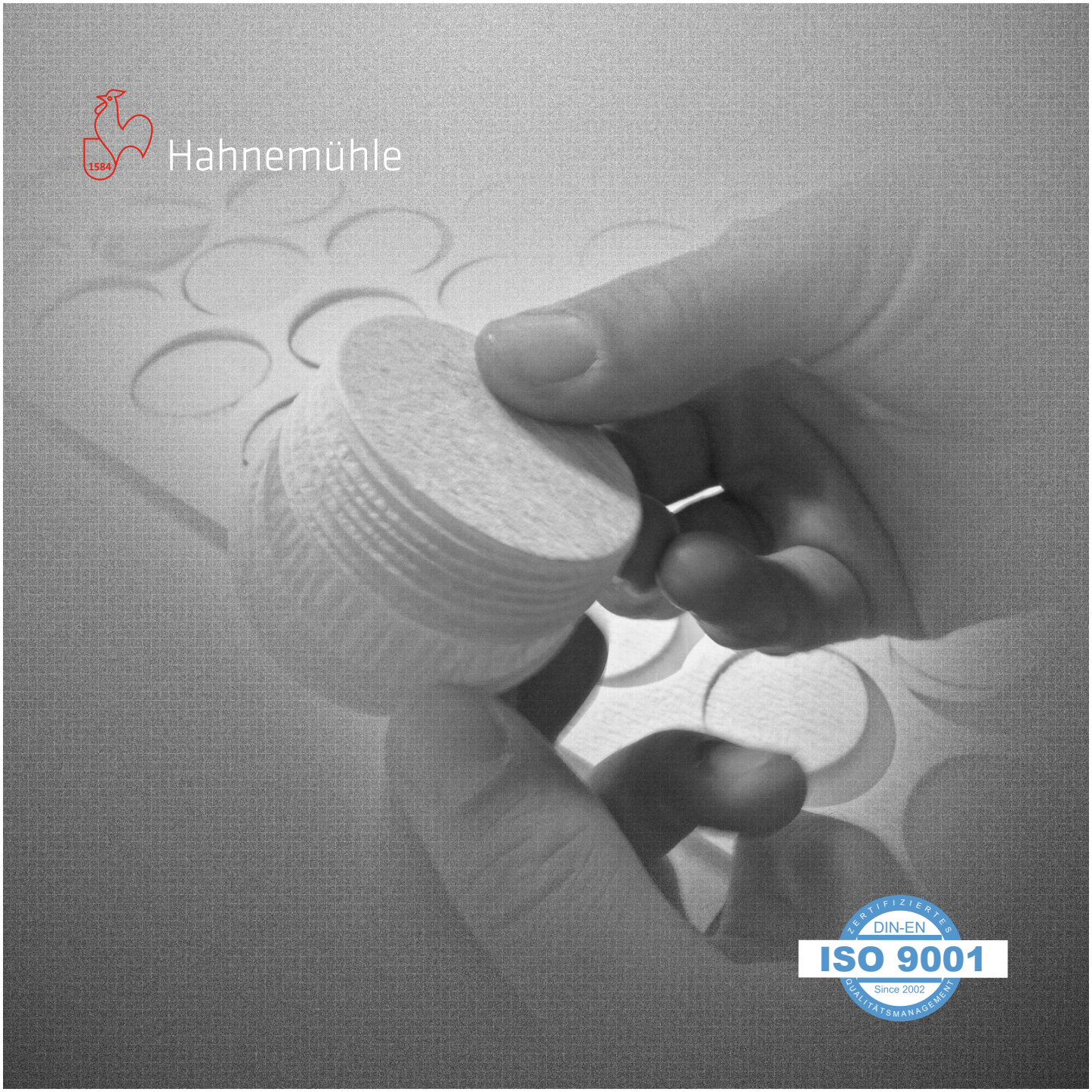

Filter Papers & Membranes

INDUSTRY & LABORATORY | Product Profile & Applications

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About Hahnemühle

As a globally operating company, Hahnemühle is focusing on the production of custom-made filter papers, in addition to the standard product range for laboratories. Our papers are known as reliable products on the market, which always provide reproducible filtration results. Many years of expertise, internal research & development and constant exchange of ideas with customers make us a reliable partner. Our development team adapts papers according to customer preferences for sensitive areas of application, even for new formulas with functional fibers. With over 150 filter papers, we offer our customers a wide spectrum of papers that cover almost all filter requirements.

Clientele

Leading companies from different fields put their trust in our products. They operate in different industries e.g. the food and beverage industry, the pharmaceutical and chemical industry, and agriculture, environmental monitoring and automotive engineering.

Strength

Our strength is close cooperation with our customers in every project phase – from development to production, to the end product. We think in terms of networks, with the necessary eye for detail. Our internal structure allows us to react quickly to changes and to adapt to new requirements. Our production systems also allow the manufacture of smaller quantities at attractive prices.

History of Hahnemühle

1584	Establishment of Hahnemühle
1883	Filter papers produced for the first time
1886	Carl Hahne buys the paper mill, which subsequently bears his name
1927 - 2004	Hahnemühle was part of the „Schleicher & Schuell“ group
Since 2008	Pure filter papers are marketed directly under the Hahnemühle name

Our Product Range for Laboratories

Hahnemühle offers a globally recognised range of premium filter papers.
We laid the foundation for our success with the development and production of grades 589/1 to 589/6.
Our filter papers are produced for both liquid and air filtration technologies in various areas of application.
The premium quality cellulose, cotton linters, glass and quartz fiber raw materials are suitable for all laboratory and industrial applications.

Our portfolio includes:

- Filter papers made of cellulose, glass fiber and quartz fiber for quantitative and qualitative analysis as well as for particle removal
- Absorbent papers sensitively detecting biological molecules such as antibodies and hormones
- Glass fibre filters for isolating DNA and RNA
- Extraction thimbles and crucibles made of cellulose, glass fiber and quartz fiber
- Glass fibre papers for determining contamination in air and gases
- Germination test papers in accordance with ISTA requirements
- Blotting papers
- Chromatography papers
- Antibiotic test papers
- Papers for surface protection
- Papers for beer analysis

- Sterile and non-sterile syringe filters with CA, CR, NY and PTFE membranes

The microfiltration range includes syringe and membrane filters for the reliably separation of microorganisms and particles in liquids, air and other gases.

Clarifying and sterile filtration, sample preparation, sterile aeration and medical applications are just some of the areas where disposable filter holders are typically used.
They are available with different pore sizes and with different hydrophilic or hydrophobic membranes.

- Sterile and non-sterile membrane filters made of AC, NC, MCE, NY and PTFE

We offer various membrane filters with pore sizes ranging from 0.2 µm – 8 µm for removing particles or collecting microorganisms from solutions for examination. From clarification and sample preparation, sterile filtration, air filtration and aeration – and even microbiological control.

Beverages

Beverages are one of the most controlled grocery products. Quality is increasingly important in conscious and sustainable consumption. During the development of analytical methods in the labs of drinks manufacturers, several of our high-quality filter grades for analysis and strict monitoring held firm and proved their worth. In the publication 'Analytical Methods in Brewing - Wort, Beer and Beer-Based Beverages', published by the Middle European Brewery Analysis Commission (MEBAK), these grades were recommended for specific detection reactions.

- Juice
- Wine
- Beer

Food

The most important factors in maintaining customer loyalty are trust, security and transparency. For the required quality assurance and raw material control, knowledge about the composition of foodstuffs is essential.
Here you will find products that enable highly sensitive detection of ingredients and contaminants in food analysis and filter grades which are suitable for process filtration of food due to their purity. For certain grades, we can confirm the conformity with U.S. FDA recommendation 21 CFR and the German BfR recommendation XXXVI and XXXVI/1.

- Edible oil
- Sugar
- Milk and milk products
- Meat and meat products

Agriculture

The determination of nutrients and trace elements is important to optimise plant and animal growth. The average ash content of our filter papers was adjusted to meet these high standards in chemical analysis. The special conditions for germination testing are established by the stringent ISTA provisions. The Hahnemühle germination test papers comply with these international provisions and permit reliable assertions regarding the germination capacity of seed.

- Soil and fertiliser
- Animal feed
- Seed

Environment

An optimum filter material simplifies and supports contamination-free sampling of suspended particles in water and particles in emissions or chemicals. Owing to their consistent performance, our pure filter papers are ideally suited to situations where unambiguous analytical results are required. Our filter papers are a reliable tool in all areas subject to strict official requirements (DIN, EPA, ASTM, etc.).

- Air pollution
- Emission control
- Water
- Waste products

Chemicals

Every chemical reagent and pharmaceutical substance is only as good as its quality. Highest quality standards are the key driver of success for any company in the areas of chemicals and pharmaceuticals. The quantitative filter papers of Hahnemühle are the purest paper in the filter market. The average ash content is between 0.004%, and 0.002%. - The purest paper in the filter market.

- Quality control
- Cleaning Materials
- Oil refinery
- Cement analysis

Pharmaceuticals & Diagnostics

Materials for producing pharmaceuticals, diagnostic tools and molecular biology tools have to meet very specific characteristics. The Hahnemühle absorbent media guarantee both high and consistent performance. The purest raw materials are used to produce these filters, thus avoiding interactions between the reagents spread in the finished test strips.

- Production and quality control of pharmaceuticals
- Papers for diagnostic test strips
- Papers for impregnation (Raw papers)
- Diagnostics

Beverages

Juice

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to the § 64 LFBG German law for food, feed and utensils
- Particle separation and clarification before optical measurements
- Sample preparation before sensitive analyses such as HPLC

Process filtration:

The pure raw materials – linters and cellulose – are used in the production of these filter papers, which allow their use with food and beverages during production. For selected grades with different retention rates, the conformity to both the U.S. FDA recommendation 21 CFR and by the German BfR (Federal Institute for Risk Evaluation) recommendation XXXVI and XXXVI/1 can be approved.

Process	Technique	Type of Filter	Filter Grade
Particle separation	Filtration (funnel/Büchner)	Filter papers for fast clarification of unsweetened juices	0858
		Filter papers for fast clarification of sweetened juice, viscous juice	0905
		Filter papers for qualitative analysis, low ash according to § 64 LFBG	604, 597, 595 593, 602h, 602eh
HPLC	Clarification of aqueous samples	0.2 µm cellulose acetate syringe filters 0.2 µm cellulose acetate membranes	SAC 020 AC 020
	Clarification of organic samples	0.2 µm nylon syringe filters 0.2 µm nylon membranes	SNY 020 NY 020
	Filtration of mobile phase	0.45 µm nylon membranes	NY 045
	Clarification of juices	0.45 µm cellulose acetate syringe filters Cellulose acetate membranes	SAC 045 AC 045
Microbiological analysis	Retention of microorganisms	White, sterile membranes cellulose nitrate 0.2 and 0.45 µm, gridded	NCS 045 NCS 020
		White, sterile membranes mixed cellulose ester, 0.2 and 0.45 µm, gridded	MCES 045 MCES 020
Spectrophotometry	Clarification of samples	Glass microfiber filters	GF 6, GF 55
Preparing fruit juice samples for photometric measurements (e.g. phosphate) according to § 64 LFBG	Filtration (funnel/Büchner)	Quantitative filter papers	589/1
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

Production	Type of Filter	Filter Grade
Protective papers in filter presses	Medium-fast, wet strength, creped	2048, 2410
	Very slow, high wet strength (hardened)	1577
Papers and cards	Very fast, wet strength	1450nf
	Medium-fast, wet strength	3605, 572, 3205
Creped papers	Very fast, wet strength, thick	520bII, 520b, 3144L
	Very fast, wet strength	520a

The average ash content of our quantitative papers is 0.004%, or 0.002% ash for the hardened quantitative papers. The purest paper in the filter market!

Different formats such as rolls, sheets and cuts are available on request.

Beverages

Wine

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to § 64 LFBG German law for food, feed and utensils
- Particle separation and clarification before optical measurements

Process filtration:

Depending on the type of contamination, various retention rates are available for wine clarification.
For selected grades, the conformity to both the U.S. FDA recommendation 21 CFR and by the German BfR recommendation XXXVI and XXXVI/1 can be approved.

Process	Technique	Type of Filter	Filter Grade
Analysis of acids (sep. of malic acid)	Paper chromatography (malolactic fermentation)	Chromatography papers	3469, 2043a
Particle separation	Filtration (funnel/Büchner)	Filter papers for qualitative analysis	604, 597, 595, 593 602, 602eh
	Preparation of samples (i.e. for L-Ascorbic acid analysis)	Grained papers for clarification of unsweetened juice	0858
		Creped filters paper for sweetened, viscous juice	0905
	Separation of PVPP (E1202)	Filter papers for clarification	400, 0858 as folded filters
	Separation of active carbon (E1202)		
	Removal of turbidity	Low ash filter papers	602h
Gravimetric analysis	Measurement of ashes	Filter papers for quantitative analysis	589/3
Determining particle load	Separation of particles in suspensions	0.8 µm cellulose nitrate membrane	NC 080
HPLC	Clarification of aqueous samples	0.45 µm cellulose acetate syringe filters	SAC 045
		0.45 µm cellulose acetate membranes	AC 045
Colour characteristics	Clarification of grape must / wine	0.45 µm cellulose acetate syringe filters	SAC 045
Spectrophotometry	Protection of the apparatus	0.45 µm cellulose acetate membranes	AC 045
Microbiological analysis	Detection of microorganisms	White, sterile cellulose nitrate membranes or mixed cellulose esters with grid, 0.2 and 0.45 µm	NCS 045, NCS 020 MCES 045, MCES 020
Sample preparation	Pre-filtration	Glass microfiber filters	GF 51

Production	Type of Filter	Filter Grade
Clarification of sweetened, viscous wines Papers and cards	Fast, wet strength	1450nf
	Medium-fast, wet strength	3205
	Creped, fast, wet strength	520a, 3144L, 520bll, 520b
Filtration of unsweetened wines	Fast, wet strength	572, 3205
	Grained, fast, wet strength	0858
	Creped, fast, wet strength	2048

Folded filters or creped filter papers are particularly suitable for quickly clarifying samples owing to the larger surface.

Different formats such as rolls, sheets and cuts are available on request.

Beverages

Beer, Malt and Beer-based Beverages

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to the § 64 LFBG German law for food, feed and utensils
- Ideal for sample preparation and clarification. Useful for removing CO_2 and turbidities
- Measurement of nitrogen compounds, proteins and trace elements

Process[1)]	Technique	Type of Filter	Filter Grade
Sample preparation for extract determination of malt	Filtration, funnel (Büchner)	Filter papers for clarification, grained	0858, 2555
Removal of CO_2 and turbidities from beer, wine and juices		Filter papers for qualitative analysis	602h, 597
Determination of solids in wort (Labor Veritas method)			GF 52
Filtration of lees			597, GF52
Determination of the coagulateable proteins			597
Determination of the grade of fermentation			597
Sample preparation			595
Determination of solids and turbidity (Feld method)			589/1
Determination of nitrogen-compounds by phosphor molybdenum precipitation		Filter papers for quantitative analysis	589/2
Determination of carbohydrates by hydrolysis			589/2
Analysis of ash content in foodstuffs according to §35 LMBG			589/1
Determination of proteins in wort and beer via $MgSO_4$ precipitation			589/1, 589/2
Drinking water: Determination of chemical elements, radioactive trace elements	Filtration, funnel (Büchner)	Filter papers for quantitative analysis	589/3
Measurement of nitrogen	Quantification of nitrogen	Weighing papers, low in nitrogen	360
Spectrophotometry	Colour of the malt	White, cellulose acetate membranes with grid, 0.45 µm	AC 045
Microbiological analyses	Microorganism count	Black, sterile cellulose nitrate membranes with grid, 0.45 µm	NCS 045

[1)] In the instructions in ‘Analytical methods in breweries - Wort, Beer, beer-based Beverages’, published by the Middle European Brewery Analysis Commission (MEBAK).

Over the course of development in brewery analytics, certain paper grades have become a fixture in ‘methods of analysis in brewing’. High-quality Hahnemühle filter papers are listed in the collection of methods produced by the Middle European Brewery Analysis Commission (MEBAK).

Different formats such as rolls, sheets and cuts are available on request.

Food

Edible Oil and Fat

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to § 64 LFBG German law for food, feed and utensils

Process	Technique	Type of Filter	Filter Grade
Measurement of fats	Extraction with Soxhlet or Tecator	Cellulose extraction thimbles	900, 901
Particle separation	Clarification of essential oils	Filter papers for extra-fast filtration	3205, 1450nf
	Clarification of edible oils	Filter papers for very fine particles	BF
Analysis in line with § 64 LFBG	Filtration (funnel/Büchner)	Filter papers for qualitative analysis	604
Determination of the unsaponifable fraction in fats	Filtration (funnel/Büchner)	Filter papers for qualitative analysis	597, 595
Analysis of oil/fats	Fat extracting equipment	Filter papers with very high wet strength	1574
		Filter papers for quantitative analysis	589/5
Quantifying particles using gravimetry	Separation of solids in oil with petrol ether	Absorptive, dense papers	602h
HPLC	Clarification of organic samples	0.2 µm nylon syringe filters 0.2 µm nylon membranes	SNY 020 NY 020
	Filtration of mobile phase	0.45 µm nylon membranes	NY 045
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

Production	Type of Filter	Filter Grade
Clarification and Purification	Fast, creped, for large particles	3144L, 2410
	Medium, creped, for small particles	610
	Fast, for coarse particles	1450nf
	Medium, for small particles	22, 2589c, 3605
	Slow, for small particles	2589d
Removal of particles from used oil in fryers	Very fast, wet strength	3144L, 1450nf

Note: The recommended grades for edible oils can even be used for technical oils with similar viscosity and particle properties.

The pure raw materials – linters and cellulose – used in the production of these filter papers permit their use in contact with food. For selected types, the conformity to both the U.S. FDA recommendation 21 CFR and by the German BfR (Federal Institute for Risk Evaluation) recommendation XXXVI and XXXVI/1 can be approved.

Different formats such as rolls, sheets and cuts are available on request.

Food

Sugar

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to the § 64 LFBG German law for food, feed and utensils
- Clarification of dried beet pulp extracts
- Filtration of beet juice after addition of lead acetate for polarimetric sugar determination
- 3459 is recommended for Venema units according to the lead acetate method

Process	Technique	Type of Filter	Filter Grade
Polarimetric determination of sugar	Clarification of dried beet pulp extracts	Fast filtration papers	3002
Venema, sodium, lead acetate methode	Clarification before polarimetric determination of sugar	Fast, creped filter papers	3459
Gravimetry	Filtration (funnel/Büchner)	Filter papers, quantitative analysis	589/1 589/2
HPLC	Clarification of organic samples	0.2 µm nylon syringe filters 0.2 µm nylon membranes	SNY 020 NY 020
	Filtration of mobile phase	0.45 µm nylon membranes	NY 045
Microbiological analysis	Detection of microorganisms	White, sterile cellulose nitrate membranes with grid, 0.2 and 0.45 µm	NCS 020 NCS 045
Improvement in filtration Clarification of samples	Pre-filters for membranes	Glass microfiber filters	GF 9
Analysis of sucrose	Clarification of samples of sugar syrup	0.45 µm cellulose acetate syringe filters 0.45 µm cellulose acetate membranes	SAC 045 AC 045
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

The filter papers optimised for clarification of beet pulp extracts offer high filtration speed combined with high retention of particles.

Different formats such as rolls, sheets and cuts are available on request.

Food

Milk and Milk Products

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to the § 64 LFBG German law for food, feed and utensils
- Gravimetric analysis and detection of metal particles
- Determination of whiteness

Process	Technique	Type of Filter	Filter Grade
Analysis in line with § 64 LMBG	Filtration (funnel/Büchner)	Filter papers for qualitative analysis	604, 595, 597
Gravimetric analysis according to § 64 LMBG		Filter papers for quantitative analysis	589/1, 589/2, 589/3
Detection of metals in fats		Filter papers for clarification	0858
Measurement of solids in suspensions	Filtration, weighing	Glass microfiber filters	GF 52
HPLC	Clarification of organic samples	0.45 µm nylon syringe filters	SNY 045
Microbiological analysis	Microorganism count	White, sterile cellulose nitrate membranes with grid, 0.2 and 0.45 µm	NCS 045, NCS 020
Degree of whiteness of milk	Sample collection	Filters made from cellulose/synthetic fibers	0048
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

We keep the promise of a documented production process with 100% batch traceability down to the raw material used.

Different formats such as rolls, sheets and cuts are available on request.

Food

Meat and Meat Products

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to the § 64 LFBG German law for food, feed and utensils
- Gravimetric analyses
- Measurement of fats

Process	Technique	Type of Filter	Filter Grade
Measurement of fats	Extraction with Soxhlet or Tecator	Cellulose extraction thimbles	900, 901
Gravimetry	Filtration (funnel/Büchner)	Filter papers for quantitative analysis	589/1, 589/2 589/3, 589/5
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE
Measurement of nitrogen	Kjeldahl weighing	Weighing papers	360

Hahnemühle FineArt GmbH offer outstanding products suitable for common processes in the analysis of food and the detection of contaminants. We are very aware of the purity and reliability which customers expect from tools for their specific filtration application.

Different formats such as rolls, sheets and cuts are available on request.

Agriculture

Soil and Fertiliser

The determination of trace elements and nutrients in soil is important to optimise agricultural crops.

Target application:

- Analysis of nutrients, mineral nutrients, contaminants and microbiological purity
- Measurement of nitrogen, potassium and phosphate
- Ideal for detecting minerals and heavy metals

Process	Technique	Type of Filter	Filter Grade
Particle separation	Filtration (funnel/Büchner)	Filter papers for clarification	0858
Measurement of nitrogen insoluble in water		Filter papers for qualitative analyses, low ash content	2095
Measurement of nitrogen		Filter papers for quantitative analyses, ash-free	589/5
Measurement of trace elements		Filter papers for quantitative analyses, ash-free	589/1, 589/2 589/3, 589/4 589/5, 589/6
Free amino acids and total amino acids		Filter papers for quantitative analyses, ash-free	589/2 589/5
Measurement of soluble sulphates	Water extraction	Filter papers for quantitative analyses, ash-free	589/3
Determination of Potassium and Phosphor	Egnér, Riehm and Lederle	Filter papers, low phosphates	589/1, 589/2 589/3, 589/4 589/5, 589/6
Measurement of solids in suspension	Filtration difference in weight	Glass microfiber filters	GF 52
Measurement of nitrates and phosphates by HPLC	Sample preparation	Nylon, 0.45 µm, syringe filters	SNY 045
Measurement of nitrogen	Weighing	Weighing papers, low in nitrogen	360

The average ash content of our quantitative papers is 0.004%, or 0.002% ash for the hardened grades. The purest paper in the filter market!

Different formats such as rolls, sheets and cuts are available on request.

Agriculture

Animal Feed

Target application:

- Analysis of nutrients, mineral nutrients, contaminants and microbiological purity
- Ideal for the detection of trace elements like Mg, Mn, Zn, Co, Cu, Mo, and B
- Measurement of fats

Process	Technique	Type of Filter	Filter Grade
Measurement of fats	Extraction with Soxhlet or Tecator	Cellulose extraction thimbles	900, 901
Particle separation	Filtration (funnel/Büchner)	Filter papers for clarification	0858
Gravimetry		Filter papers for quantitative analysis	589/1, 589/2 589/3, 589/4 589/5, 589/6
Measurement of Calcium		Filter papers for quantitative analysis	589/2
HPLC	Clarification of organic samples	Syringe filters with nylon membranes or regenerated cellulose, 0.45 µm	SNY 045 SCR 045
	Filtration of mobile phase	Nylon membranes, 0.45 µm	NY 045
Microbiological analysis	Detection of microorganisms	White cellulose nitrate membranes, 0.45 µm, gridded	NCS 045
Separation of solids from suspensions	Filtration, weight determination	Glass microfiber filters	GF 52
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

The high consistency of filtration quality ensures reliable results of the analysis from one lot to the other.

Different formats such as rolls, sheets and cuts are available on request.

Agriculture

Germination Testing

- All papers are made of pure cellulose and are free from mould, bacteria and any toxic substances which might interfere with the growth of seeds
- The highly absorbent papers store sufficient moisture for the whole duration of the test
- Their low density means the papers have a high degree of absorbency, but the roots are not able to grow into the paper
- The conductivity of the papers is lower than 40 mS/m, and the pH is between 6.0 and 7.5
- We offer a broad range of papers for the various germination methods TP, BP and PP

Target application:

The high purity of Hahnemühle germination test papers means they are very well suited for testing the germination of medium large and coated seeds (sugar beet, fodder beet, grain, sunflower, rapeseed, mustard), seeds with small, white rootlets, grain, very sensitive seeds, small seeds (flowers, grasses).

Process	Technique	Type of Filter		Filter Grade
Measurement of fats	Extraction with Soxhlet or Tecator	Cellulose extraction thimbles		900, 901
Seed germination	PP method (pleated paper)	Germination test papers, pleated strips, White Grey Wrapping strips		 3014 3236 0858
	TP method (top of paper)	Germination test papers as wrapping strips, for Jacobsen tank, for petri dishes	Thin, 81g 140g Creped, 135g Filter card Filter card Filter card 165g 150g	597 598 520bII 3621 light blue 3633 light blue 3644 blue 3645 yellow 3024
	BP method (between paper)	Germination test papers		520b 5703
Dust control	Particle collection by dust meter	Glass microfiber filters with binder		GF 9
Prevention of penetration by roots, protection of surfaces	Absorption	Absorbent papers with polyethylene layer on one side		295 PE

Hahnemühle is the preferred and trusted Seed Testing Paper manufacturer for many Seed Testing Companies around the world. The stringent ISTA (International Seed Testing Association) provisions are adhered to as early as the production stage.

Different formats such as rolls, sheets and cuts are available on request.

Environment

Air Pollution

Target application:

- Ambient air monitoring
- Determination of suspended particles (SPM: suspended particular matter) and total suspended particles (TSP: total suspended particular matter)
- Detection of PM10 and lead (Pb)
- Monitoring the presence of pollutants in the air at different measuring points

Process	Apparatus	Technique	Type of Filter	Filter Grade
Sampling of total suspended particulate matter TSP (Ø >30µm)[1]	High volume capturer	Gravimetry	Glass microfiber filters, in line with US EPA	GF 50
	Low volume capturer			GF 50
	Cascade impactor			GF 50
Sampling and analysis of PM10 (Ø > 10µm)[1][2][3]	High volume capturer		Quartz microfiber filters, in line with US EPA and DIN EN ISO 23210	QFH
	Low volume capturer			QFH
	Cascade impactor			QFH
Sampling and analysis of PM2.5 (Ø >2.5µm)[1]	High volume capturer		Quartz microfiber filters, in line with US EPA and DIN EN ISO 23210	QFH
	Low volume capturer			QFH
	Cascade impactor			QFH
Sampling and analysis of lead[4]	High volume capturer	Atomic absorption spectroscopy	Quartz microfiber filters, in line with US EPA and DIN EN ISO 23210	QFH
	Low volume capturer			QFH
	Cascade impactor			QFH

1) Reference methods in '40CFR50 Appx B, J, L, and G' in the 'Federal Register of the US EPA'
2) Air quality in accordance with EN 12341
3) Directive 2008/50/EC, in European standard EN 12341
4) Ambient air quality in accordance with EN 14902:2005

Glass microfiber and quartz microfiber filters are recommended for the analysis of atmospheric pollution and for particle determination at high temperatures.

Different formats such as rolls, sheets and cuts are available on request.

Environment

Emission Control

Target application:

- Monitoring of anthropogenic atmospheric emissions (oil refineries, power stations, burning of liquid and solid fuels, cement factories, mining industries, incinerators, iron foundries, grinderies, asphalt plants, glassmakers, ceramic factories) and at stationary sources
- Measurement of dust release in workplace and production processes, exhaust fumes from private houses, and newly developed engines (for cars and other vehicles)

Process	Apparatus	Technique	Type of Filter	Filter Grade
Measurement of nitrogen (gravimetry)[1) 2) 3) 4)]	Isokinetic probe with rear filter-holder (up to 500ºC)	Filtration, weighing	Glass microfiber filters Glass fiber thimbles	GF 50 CFV
	Isokinetic probe with front filter-holder (up to 900ºC)		Quartz microfiber filters Glass fiber thimbles	QFH CFV
Measurement of inorganic lead[5)]	Isokinetic probe with rear filter-holder (up to 500ºC)	Atom absorption spectroscopy	Glass microfiber filters Glass fiber thimbles	GF 50 CFV
Measurement of metals[6)]	Isokinetic probe with rear filter-holder (up to 500ºC)		Glass microfiber filters Glass fiber thimbles	GF 50 CFV
	Isokinetic probe with front filter-holder (up to 900ºC)		Quartz microfiber filters Glass fiber thimbles	QFH CFV
Deposition of radioactive aerosols	Filtering instrument	Filtration, Scintillation	Glass microfiber filters, retention capability < 1µm	GF6
Monitoring the combustion air	Filtering instrument	Filtration, weighing	Glass microfiber filters	GF8, GF9
Monitoring particles in air and gases	Automatic air filter units, air analysers with filter rolls	Filtration, weighing	Glass microfiber filters with high mechanical strength	GF10
Smoke test / house coal	Portable measurement instrument	Filtration + optical evaluation	Fast, white filter papers, high air permeability	604L
Emission test / engine development[7)]	Automatic air filter units, air analysers with filter rolls	Filtration + optical evaluation	Medium-fast filter papers, small particle retention, white	597L

1) EPA 5
2) EPA 17
3) UNE ISO 9096
4) EN 13284
5) EPA 12
6) EPA 29
7) Stationary emissions sources. Optical on-site analysis

Glass and quartz fiber filters are resistant to high temperatures and aggressive chemicals, with the exception of hydrofluoric acid. Due to their purity, chemical stability and high filtration performance, these materials are highly suitable for air and emissions monitoring.

Different formats such as rolls, sheets and cuts are available on request.

Environment

Water

Target application:

- Gravimetric analyses of organic and inorganic contaminants in water and waste water
- Monitoring microbiological quality of drinking water
- Determination of total dry residue
- Determination of dissolved organic carbon (DOC) and total organic carbon (TOC)

Process	Technique	Type of Filter	Filter Grade
Sample preparation	Clarification	Qualitative filter papers	595
Total dry residue, ash residue[2) 3)]	Filtration, weighing	Glass microfiber filters	GF 6
		Quantitative filter papers	589/1
Measurement of solids in suspensions after drying at 105°C[1) 2) 17)]	Filtration, weighing	Glass microfiber filters	GF 52, GF 6
Measurement of the total remainder after drying at 180°C[5) 6)]			GF 52, GF 6
Solids and volatiles after incineration at 550°C[7)]			GF 50
Suspended particles[8)]			GF 52, GF 6
Colouration[2)]	Filtration		GF 6, GF 50
Radioactivity			
Measurement of metals			
Measurement of total and dissolved organic carbon[9) 10) 11)]	Filtration, combustioninfrared	0.45 µm cellulose acetate membranes 0.45 µm mixed cellulose ester membranes	AC 045 MCE 045
	Filtration, oxidation	Glass microfiber filters	GF 6, GF 52
Measurement of dissolved iron[2)]	Filtration	0.45 µm cellulose acetate membranes	AC 045
Measurement of metals (pre-filtration)[12)]	Filtration, ASS	0.45 µm cellulose acetate membranes	AC 045
Measurement of oils and fats[13)]	Buchner funnel	Quantitative filter papers	589/4
Measurement of metals			589/1, 589/3
Measurement of radioactivity[15)]	Precipitation (Ra)	0.45 µm cellulose acetate membranes	AC 045
Measurement of non-metallic inorganic compounds[16)]	Filtration	Quantitative filter papers	589/1, 589/3 589/5
Measurement of oils and fats[13)]	Extraction with Soxhlet or Tecator	Cellulose extraction thimbles	900, 901
Microbiological analyses of drinking water	Filtration	Sterile, mixed cellulose ester membranes 0.2 / 0.45 µm, white, gridded	MCES 020, MCES 045
		Sterile, cellulose nitrate membranes, 0.2 µm or 0.45 µm, gridded	NCS 020, NCS 045
Microbiological analyses of drinking water, legionella		Sterile, cellulose nitrate membranes, 0.2 / 0.45 µm, black, gridded	NCS 045

1) DIN EN 872
2) DIN 38409-1
3) DIN 38409-2 D
4) UNE 77031
5) 2540 C Standard Methods
6) 2540 E Standard Methods
7) 2530 B Standard Methods
8) UNE EN 1484
9) 5310 B Standard Methods
10) 5310 D Standard Methods
11) 3030 B Standard Methods
12) UNE 77037
13) DIN 38409 D
14) 7500-Ra B Standard Methods
15) Part 4000 Standard Methods
16) DIN 38409 H2-2
17) 2540 C Standard Methods

Different formats such as rolls, sheets and cuts are available on request.

Glass fiber grade GF 6 is ideal for gravimetric analyses of organic and inorganic impurities in water and wastewater according to DIN 38409 and EN 872 (suspended particles). The inorganic binder increases solidity and does not distort the gravimetric output in annealing with 500 °C as stipulated.

Environment

Waste Products

Target application:

- Analysis of waste products in the disposal of industrial waste and laboratory waste
- Particle separation and clarification before further measurements
- Sample preparation and washing out of samples for characterisation of toxic substances

Process	Technique	Type of Filter	Filter Grade
Characterisation of dangerous substances	Filtration	0.2 µm cellulose acetate membranes 0.2 µm cellulose nitrate membranes	AC 020, NC 020
	Filtration (funnel/Büchner	Filter papers for clarification	0905
Characterisation of toxic substances[1)]	Pressure filtration	Glass microfiber filters	GF 52
Analysis of contaminated soil[2)]	Extraction by water	0.45 µm cellulose nitrate membranes 0.45 µm cellulose acetate membranes	NC 045, AC 045
Filtration of biosolids/sludge from wastewater	Continuous filtration by filterbelt	Fast, very high wet strength	1573
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer	295 PE

1) EPA 1311 TCLP
2) DIN 38414-4

Folded filters or creped filter papers are particularly suitable for quickly clarifying samples owing to the larger surface in comparison with round filters.

Different formats such as rolls, sheets and cuts are available on request.

Chemicals

Quality Control

Target application:

- Clarification before quantitative analysis
- Sample preparation before HPLC
- Microbiological investigations
- Extraction before an analysis

Process	Technique	Type of Filter		Filter Grade
Separation of solids from suspensions	Filtration (funnel, Büchner)	Filter papers for clarifying fluids	Smooth Grained Creped	0860 0858 0905
Gravimetry	Filtration (funnel, Büchner)	Filter papers for quantitative analyses		589/1, 589/2 589/3, 589/4 589/5, 589/6
		Hardened filter papers for quantitative analyses		1505, 1506, 1507
Analysis of chemicals	Paper chromatography	Chromatography papers		3469, 2043a
Clarification of samples	Pre-filters for membranes	Glass microfiber filters		GF 9
Analysis of extractables	Extraction	Cellulose extraction thimbles		900, 901
Microbiological analysis	Detection of microorganisms	Cellulose nitrate membranes with grid, 0.45 and 0.2 µm, sterile Mixed cellulose ester membranes with grid, 0.45 µm and 0.2 µm, sterile		NCS 045 NCS 020 MCES 045 MCES 020
	Clarification of biological fluids	Sterile syringe filters with cellulose acetate 0.45 µm and 0.2 µm		SACS 045 SACS 020
HPLC	Preparation of organic samples	Nylon syringe filters, 0.2 µm		SNY 020
	Filtration of mobile phase	Nylon membranes, 0.2 µm		NY 020
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer		295 PE

The high consistency of the quality level ensures reliable analysis findings from one lot to the other over many years without the need to adjust analysis procedures.

Different formats such as rolls, sheets and cuts are available on request.

Chemicals

Cleaning Materials

Target application:

- Clarification before quantitative analysis
- Gravimetric measurements
- Sample preparations before HPLC

Process	Technique	Type of Filter		Filter Grade
Gravimetry	Filtration (funnel, Büchner)	Filter papers for quantitative analysis		589/1, 589/2 589/3, 589/4 589/5, 589/6
Particle separation	Filtration (funnel, Büchner)	Folded filters for clarification	Smooth Grained Creped	0860 0858 0905
Determination of tenside content	Filtration (funnel, Büchner)	Glass microfiber filters		GF 50
HPLC	Clarification of samples	Syringe filters, with nylon, 0.45 µm		SNY 020
Separation of solids in suspensions	Clarification of samples	Syringe filters, with nylon, 0.2 µm		SNY 020
	Filtration of mobile phase	Nylon membranes		NY 020
	Filtration (Funnel/Büchner)	Glass microfiber filters		GF 52
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer		295 PE

The average ash content of our quantitative papers is 0.004%, or 0.002% ash for the hardened grades. The purest paper in the filter market!

Different formats such as rolls, sheets and cuts are available on request.

Chemicals

Oil Refinery

Target application:

- Clarification before quantitative analysis
- Gravimetric measurements
- Analysis of soot particles

Process filtration:

Removal of particles from used oil

Process	Technique	Type of Filter		Filter Grade
Gravimetry	Filtration (funnel/Büchner)	Filter papers for quantitative analysis		589/1, 589/2 589/3, 589/4 589/5, 589/6
		Hardened filter papers for quantitative analysis		1505, 1506, 1507
Solid-liquid separation	Filtration (funnel/Büchner)	Folded filters for clarification	Smooth Grained Creped	0860 0858 0905
		Filter papers for qualitative analysis, low ash		591
Extraction of organic compounds	Extraction with Soxhlet	Cellulose extraction thimbles		900
Determination of solids in suspensions	Filtration, weighing	Glass microfiber filters		GF 52
Protection of apparatus and surfaces	Absorption	Absorbent papers with polyethylene layer		295 PE
Determination of particles with diameter ≥ 0.8 µm	Filtration, weighing	White, smooth cellulose nitrate membranes 0.8 µm		NC 080
Determination of particles with diameter ≥ 0.45 µm		White, smooth cellulose nitrate membranes 0.45 µm		NC 045
Monitoring of soot in oil (OCM)	Dispersancy of the oil on absorptive paper	Absorptive, dense filter papers		602h

Production	Type of Filter	Filter Grade
Clarification and purification	Fast, creped, for large particles	3144L, 2410
	Fast, for coarse particles	1450nf
	Medium-fast, for small particles	22, 2589c, 3605
	Slow, for small particles	2589d
Removal of particles from used oils	Very fast, wet strength	3144L, 1450nf

Owing to the larger surface in comparison with round filters, folded filters or creped filter papers are particularly suitable for quickly clarifying samples – particularly in cases of viscous fluids such as oils.

Different formats such as rolls, sheets and cuts are available on request.

Chemicals

Cement Analysis

Target application:

- Ensuring product quality
- Determination of water retention capacity
- Determination of grind level

Process (Technique)	Filter Type		Size Ø [mm]	Grade	Weight [g/m²]	Thickness [mm]
Water retention capacity (DIN EN 413-2)	Filter papers		100	3469	192	0.36
				2589A	200	0.45
Building lime (DIN EN 459-2)	Filter cards		190 x 190 sheets	2727	700	1.3
Mortar with binders containing minerals (DIN 18555-7)	Filter cards		190 x 190 sheets	2727	700	1.3
Blaine test (grinding fineness of cement) (DIN EN 196-6)	Filter papers	fast	12.5	589/1	79	0.19
			12.7			
			40.5			
		medium-fast	12.7	589/2	86	0.18
			40.5			
		fast	41.5	589/1	79	0.19

The quality of mortar and cement is regulated by German and European norms. Hahnemühle offers filter papers which enable manufacturers to comply with these norms and which are well established in this application area.

Different formats such as rolls, sheets and cuts are available on request.

Pharmaceuticals & Diagnostics

Production and Quality Control of Pharmaceuticals

Target application:

- Monitoring purity, contamination and inspecting microbiological purity
- Clarification before analysis
- Gravimetric measurements
- Sample preparations before HPLC

Process	Technique	Type of Filter	Filter Grade
Separation of solids from suspensions	Filtration (funnel/Büchner)	Filter papers for clarifying fluids	0860, 0858
Gravimetry	Filtration (funnel/Büchner)	Filter papers for quantitative analyses	589/1, 589/2 589/3, 589/4 589/5, 589/6
Clarification of samples	Pre-filters for membranes	Glass microfiber filters	GF 9
Microbiological analysis	Detection of microorganisms	Cellulose nitrate membranes with grid, 0.45 µm and 0.2 µm, sterile	NCS 045 NCS 020
	Clarification of biological fluids	Cellulose acetate membrane filters, 0.2 µm and 0.45 µm Sterile syringe filters with cellulose acetate 0.45 µm and 0.2 µm	AC 020, AC 045 SACS 045, SACS 020
Identification of pathogens/ resistance against antibiotics or chemotherapeutics	Measurement of the inhibition zone on inoculated nutrient agar	Cotton linters papers of highest purity 0.35 mm 0.90 mm 0.73 mm	22 2668 3324
HPLC	Preparation of organic samples	Syringe filters with nylon	SNY 020 SCR 020
	Filtration of mobile phase	Nylon membranes, 0.2 µm	NY 020

Production	Type of Filter	Filter Grade
Protective papers in filter presses	Medium-fast, wet strength, creped	2048, 2411
	Very slow, high wet strength (hardened)	1577
Papers and cards	Very fast, wet strength	1450nf
	Medium-fast, wet strength	3605, 572, 3205
	Slow, wet strength	2589d, 2589e
Creped papers	Very fast, wet strength, thick	520bII, 520b, 3144L
	Very fast, wet strength	520a

The high consistency of the paper quality level ensures reliable results of the final test device from one lot to the other over many years.

Different formats such as rolls, sheets and cuts are available on request.

Pharmaceuticals & Diagnostics

Papers for Diagnostic Test Strips

Purpose of producing diagnostic test strips:

- Use of papers and glass fiber media which are high-performing and consistent
- Avoid interactions between the reagents spread in the finished test strips with the raw material of the paper
- High wet strength for safe handling during roll-to-roll impregnation
- High consistency in paper quality, particularly in thickness and capillary force, over the entire paper roll produced for reliable analysis results from lot to lot

Process	Water Absorbency g/100 cm²	Capillary Rise (Klemm)	Filter Grade	Thickness
Separation of solid	1.20	-	597L	0.17 mm
	1.20	75 mm/10 min	597nf	0.18 mm
	1.25	105 mm/30 min	2043a	0.17 mm
	2.40	115 mm/30 min	2316	0.30 mm
	3.30	140 mm/30 min	23SL	0.45 mm
	3.35	125 mm/10 min	2992	0.47 mm
	5.80	150 mm/10 min	3324	0.69 mm
	7.40	155 mm/10 min	BP003	0.90 mm
Wicking/Blotting	-	170 mm/30 min	2727	1.30 mm
	2.70	65 mm/10 min	BP002	0.35 mm
	7.40	155 mm/10 min	BP003	0.90 mm
	14.00	-	BP005	1.50 mm
Sample collection	1.20	-	597L	0.17 mm
	3.35	125 mm/10 min	2992	0.47 mm
	2.70	65 mm/10 min	3469	0.35 mm
Sample application	-	130 mm/10 min	GF 51	1.00 mm
	-	90 mm/10 min	GF 55	0.40 mm
	5.80	150 mm/10 min	3324	0.69 mm
	7.40	155 mm/10 min	2668	0.90 mm
	-	170 mm/30 min	2727	1.30 mm
Conjugate release	-	130 mm/10 min	GF 51	1.00 mm
	14.00	-	BP005	1.50 mm
	-	90 mm/10 min	GF 55	0.40 mm

Hahnemühle offers a range of absorbent papers made from cellulose, linters and glass fibers, which have long been manufacturers' first choice. They use them to make lateral flow and flow-through tests or dipsticks, e.g. as critical 'point of care' urine test strips.

Different formats such as rolls, sheets and cuts are available on request.

Pharmaceuticals & Diagnostics

Papers for Impregnation (Raw Papers)

Purpose of using absorbent papers for impregnation:

- Use of ultrapure paper grades – linters and cellulose – without chemical additives to avoid interference in the detection reaction
- Homogeneous dispersion of the impregnation solution
- High consistency in thickness and capillary force lot to lot
- High wet strength for safe handling during reel-to-reel impregnation

Target application:

- Production of indicator strips used for chemical detection in liquids and gases
- Use as raw paper for indicators of humidity and radioactive irradiation
- Use as proof of sterilising performance of autoclaves (Bowie Dick test)

Weight [g/m²]	Wet Strength Water Column [mm]	Capillary Rise [mm/10min]	Filter Grade	Thickness
250	1300	140 (30 min)	23SL	0.44 mm
82	1300	75	597nf	0.17 mm
165	300	115 (30 min)	2316	0.34 mm
192	350	65	3469	0.35 mm

We keep the promise of a documented production process with 100% batch traceability down to the raw material used.

Different formats such as rolls, sheets and cuts are available on request.

Pharmaceuticals & Diagnostics

Diagnostics

Purposes of manufacturing diagnostics:

- Highest level of raw paper purity to produce highly sensitive allergy tests
- Highest yield in isolation of DNA/RNA
- High wet strength for use in blotting after gel electrophoresis

Process	Technique	Type of Filter	Filter Grade
Separation and isolation of DNA, RNA	Filtration (even by centrifuge)	Glass microfiber filters without binder	GF 50, GF 51, GF 52
Tests for diseases and allergies etc.	Sample device for detection reactions with enzymes, antibodies (impregnation)	Pure, absorptive filter papers, almost no contaminants	589/1, 589/2 589/3, 589/4 589/5, 589/6
Tests for viral and bacterial diseases/infections	Blotting after gel electrophoresis	Pure, absorptive and wet strength blotting papers	BP002, BP003 BP005, 2727, 2589A
Microbiological analysis	Detection of microorganisms	Cellulose nitrate membranes with grid, 0.45 µm and 0.2 µm, sterile	NCS 045 NCS 020
	Clarification and sterilisation of biological fluids/culture media	Cellulose acetate membrane filters, 0.45 µm and 0.2 µm Sterile syringe filters with cellulose acetate 0.2 µm and 0.45 µm	AC 020, AC 045 SACS 020 SACS 045
HPLC	Preparation of biological samples	Syringe filters with nylon	SNY 020
	Filtration of mobile phase	Nylon membranes, 0.2 µm	NY 020

Production	Type of Filter		Filter Grade
Filter presses, filtration of reagents	Creped	medium-fast	2410
	Filter card	medium-fast fast - slow	3605 2589A – 2589E
	Hardened	fast, medium-fast slow, very slow	1573, 1574, 1575, 1577
Protective papers in filter presses	Medium-fast, wet strength, creped		2048, 2410
	Very slow, high wet strength (hardened)		1577
Filter papers and cards	Very fast, wet strength		1450nf
	Medium-fast, wet strength		3605, 572, 3205
	Slow, wet strength		2589d, 2989e
Creped papers	Very fast, wet strength, thick		520bII, 520b, 3144L
	Very fast, wet strength		520a

The pure raw materials – linters and cellulose – are used in the production of these filter papers, which allow their use with pharmaceuticals and food during the production stage. For selected grades with different retention rates, the conformity to both the U.S. FDA recommendation 21 CFR and by the German BfR (Federal Institute for Risk Evaluation) recommendation XXXVI and XXXVI/1 can be approved.

Different formats such as rolls, sheets and cuts are available on request.

Ashless Filter Papers for Quantitative Analysis

Recommended for quantitative analyses, routine gravimetric tests and sample preparation for instrumental analyses

Page 32

Hardened Ashless Filter Papers for Quantitative Analysis

For vacuum and pressure filtration and the use of acidic and alkaline solutions under pressure for quantitative analyses

Page 33

Highly Pure Filter Papers for Qualitative Analysis

Precise identification of materials and sample preparation for sensitive, qualitative detection methods

Page 34

Hardened Highly Pure Filter Papers for Qualitative Analysis

For vacuum and pressure filtration and the use of acidic and alkaline solutions under pressure for qualitative analyses

Page 35

Glass Fiber Filters

Controlling air and water pollution

Page 36

Quartz Fiber Filters

Atmospheric pollution control and for particles determination at high temperatures

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Universal Filter Papers for Clarification Filtration

For clarifying liquids and preparing samples

Page 39

Filter Papers for Technical and Industrial Use

Cellulose and linter papers with different surfaces and grammages

Page 40

Low Nitrogen Filter Papers

For filtering fine precipitates to determine their nitrogen content

Page 43

Kieselguhr (Diatomaceous Earth) Filter Papers

For separating very fine, semi-colloidal turbidity

Page 43

Activated Carbon Filter Papers

For separating very fine, semi-colloidal turbidity

Page 44

Black Filter Papers

For the detection of very fine traces of light particles and precipitates

Page 44

Filter Papers for Malt and Beer Analysis

For analytical methods in breweries and sample preparation

Page 45

Filter Papers for the Sugar Industry

Clarifying filtration of beet extracts and juices prior to analysis

Page 45

Cellulose Extraction Thimbles

For controlling food products and consumer goods and environmental monitoring

Page 46

Glass & Quartz Fiber Extraction Thimbles

Analyses of particles and aerosols in hot air

Page 47

Blotting Papers
For various blotting methods after electrophoresis

Page 48

Antibiotic Test Papers
For determining the effectiveness of antibiotics on infectious pathogens

Page 48

Absorbent Protective Papers with Polyethylene Layer
Effective, water-proof surface protection for work surfaces

Page 49

Chromatography Papers
Recommended for chromatographic analyses and preparations

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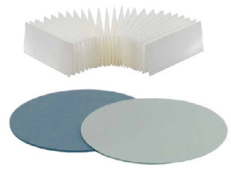


Seed Germination Test Papers
Recommended for the reliable evaluation of seeds in accordance with ISTA guidelines

Page 50

Weighing Papers
Smooth and polished surfaces on both sides

Page 52

Lens Cleaning Papers
For cleaning sensitive, optical surfaces

Page 52

Cellulose Acetate Membrane Filters
Recommended for aqueous samples, biological applications and protein filtration

Page 53

Cellulose Nitrate Membrane Filters
For the clarification and sterilisation of aqueous solutions, microbiological analyses and particle counts

Page 54

Mixed Cellulose Ester Membrane Filters
Ideal for clarification and sterilisation

Page 55

Nylon Membrane Filters
Chemically stable membrane for preparing samples

Page 56

PTFE Membrane Filters
Highly chemically resistant membrane with a high degree of mechanic stability

Page 57

Cellulose Acetate Syringe Filters
High flow rates, also available as sterile peel-packs

Page 58

Regenerated Cellulose Syringe Filters
Low protein adsorption

Page 59

Nylon Syringe Filters
High resistance for HPLC and GC applications

Page 60

PTFE Syringe Filters
Highly chemically resistant, hydrophobic

Page 61

Ashless Filter Papers for Quantitative Analysis

Ashless filters (approx. 0,004%), recommended for quantitative analysis, routine gravimetric tests and sample preparation for instrumental analysis.

- The α-cellulose content is above 98%, therefore filter paper has a high stability and durability
- Acid-washed and rinsed with water to neutralise
- Free of minerals and metallic ions, ideal for the detection of metallic ions
- Perfectly qualified for food control, beverage analysis and environmental monitoring

Gravimetric analysis: Type of quantitative analysis that involves the precipitation of a chemical compound that can be weighed and analysed once dried.

Technical data

	Grade	Properties	Filtration Herzberg [s]	Retention of particles* [µm]	Weight [g/m²]	Thickness [mm]
●	589/1 – black ribbon	fast	50	12 – 25	79	0,19
○	589/2 – white ribbon	medium-fast	140	4 – 12	85	0,18
●	589/3 – blue ribbon	slow	750 **	< 2	84	0,16
●	589/4 – yellow ribbon	medium-fast, low-fat	170	4 – 7	81	0,17
●	589/5 – red ribbon	medium-fast	450	2 – 4	84	0,17
●	589/6 – green ribbon	slow, thin	900	2	74	0,15

* Approximate values ** Measured with 100 mm water column instead of 50mm

Applications

Grade 589/1 – black ribbon

- Fast filtration for coarse and gelatinous precipitates
- Total dry/ash residue as per DIN 38409 H1 and 2
- For food analyses as per §64 LFBG
- Blaine test (cement, directives UNE 80-112-91 and EN-196-6)
- Analyses of beverages as per MEBAK specifications

Grade 589/2 – white ribbon

- Medium-fast filtration for coarse precipitates
- Analysis of alkaline earth carbonates and galvanic baths
- For food analyses as per §64 LFBG
- Blaine test (cement, directives UNE 80-112-91 and EN-196-6)
- Analysis of beverages as per MEBAK specifications

Grade 589/3 – blue ribbon

- For very fine crystalline precipitates
- Analyses of oil/fats: proportion of soluble contaminants
- Ground analyses: Measurement of soluble sulphates
- Collection of samples in medical diagnostics: Allergy testing

Grade 589/4 – yellow ribbon

- For very fine crystalline precipitates
- Analyses of oil/fats: proportion of soluble contaminants
- Ground analyses: Measurement of soluble sulphates
- Collection of samples in medical diagnostics: Allergy testing

Grade 589/5 – red ribbon

- For fine crystalline precipitates
- Determination of sulfates, carbonates and organic materials

Grade 589/6 – green ribbon

- For fine crystalline precipitates
- CaC_2O_4, $PbSO_4$, $BaSO_4$ (hot-felled precipitates)

Hardened Ashless Filter Papers for Quantitative Analysis

Hardened ashless filters (approx. 0,002%) are especially recommended for vacuum and pressure filtration, and for the use of acidic and alkaline solutions.

- Extremely robust owing to the addition of a chemically stable resin (low nitrogen content) that does not significantly contaminate the filtrate
- High resistance to aggressive chemical components, like sulphuric and nitric acids (up to 40% at 50° Celsius) and alkalis (up to 10% at 20° Celsius)
- Acid-washed and rinsed with water to neutralise
- Free of minerals, ideal for the detection of metallic ions

Technical data

	Grade	Properties	Filtration Herzberg [s]	Retention of particles* [µm]	Weight [g/m²]	Thickness [mm]
Hardened ashless filter papers	1505	fast	50	12 – 25	88	0,17
	1506	medium-fast	170	4 – 12	90	0,16
	1507	slow	600 **	≤ 2	90	0,14

* Approximate values ** Measured with 150 mm water column instead of 50 mm

Applications

Grade 1505

- For coarse crystalline precipitates
- Total dry/ash residue as per DIN 38409 H1 and 2
- For food analyses as per §64 LFBG
- Analysis in electroplating: baths of aluminium, chrome and copper

Grade 1506

- For fine crystalline precipitates
- Gravimetric determination of metals in acidic/alkaline solutions

Grade 1507

- For very fine crystalline precipitates
- Gravimetric analysis of fine metals: barium and lead sulphate, nickel and tin sulphide, oxalate and calcium fluoride

Highly Pure Filter Papers for Qualitative Analysis

Highly pure filter papers (approx. 0,08% ash) are ideal for precise identification of materials and for sample preparation prior to sensitive detection methods.

- These papers are perfectly qualified to yield reliable results for food controls as per §64 LFBG, beverage analyses and environmental monitoring
- A large selection of filter circles, folded filters, sheets and rolls is available
- For critical filtering processes, we recommend hardened, ashless filters, which have a greater resistance to both humidity and aggressive chemicals. (Grade: 1573, 1574, 1575, and 1577)

Technical data

	Grade	Properties	Filtration Herzberg [s]	Retention of particles* [µm]	Weight [g/m²]	Thickness [mm]
Highly pure filter papers	604	fast	50	12 – 25	79	0,19
	591	medium-fast, thick	90	7 – 12	161	0,35
	598	medium-fast, thick	100	8 – 10	140	0,32
	597	medium-fast	155	4 – 7	85	0,18
	597L	medium-fast	170	4 – 7	81	0,17
	595	medium-fast, thin	160	4 – 7	68	0,15
	593	medium to slow	450	2 – 5	84	0,17
	602h	slow / dense	750**	2	84	0,16
	602eh	very slow / very dense	1500**	< 2	84	0,15

* Approximate values ** Measured with 100 mm water column instead of 50 mm

Applications

Grade 604

- For coarse crystalline precipitates
- Sodium chloride in foodstuffs, ferrous hydroxide, aluminum hydroxide and metal sulphide analysis
- Routine cleaning of organic extracts and biological fluids
- For food analyses as per §64 LFBG
- High flow rates in air pollution monitoring and exhaust fumes detection

Grade 591

- For medium-fine, crystalline precipitates
- Its thickness enables greater load quantities of solutes
- Determination of water retention in mortar (EN 413-2:1994)

Grade 593

- For fine crystalline precipitates
- Barium sulphate (hot), tin sulphide
- Soil analyses

Grade 597

- For medium-fine, crystalline precipitates
- Calcium oxalate, metal sulphide
- Determination of the fat content of foods as per §64 LFBG (folded) and in milk and dairy products as per DIN 10342
- Preparation of samples and removal of CO_2 in the beverage industry, recommendation by the European Brewery Convention/MEBAK

Grade 595

- For medium-fine, crystalline precipitates
- For determining the overall fat content of food products as per §64 LFBG (folded)
- Determination of the unsaponifiable fraction in fats and oils
- Digestion of solids with aqua regia e.g. for ICP/AAS analysis (folded)

Grade 598

- For fast filtration of medium fine particles
- Its thickness enables a greater particle load

Grade 602h

- For very fine crystalline precipitates
- Determination of the soot content of lubricants (oil condition monitoring, OCM)
- Preparation of samples and removal of CO_2 in the beverage industry, recommendation by the European Brewery Convention/MEBAK

Grade 602eh

- For ultrafine filtration, particle size of <1 µm
- For environmental analysis

Grade 597L

- Made of 100% ultrapure cotton linters
- For fine particles
- For determining the nitrate content of food products as per §64 LFBG
- Detection of soot in exhaust fumes

Hardened Highly Pure Filter Papers for Qualitative Analysis

Hardened highly pure filter papers (approx. 0,05%) with extremely high chemical and mechanical resistance, especially recommended for vacuum and pressure filtration, and for the use of acidic and alkaline solutions.

- Extremely robust owing to the addition of a chemically stable resin (low nitrogen content) that does not significantly contaminate the filtrate
- High resistance to aggressive chemical components, like sulphuric and nitric acids (up to 40% at 50° Celsius) and alkalis (up to 10% at 20° Celsius)
- Made of super-refined cotton linters and cellulose with an α-cellulose content above 98%, therefore high stability and durability

Technical data

	Grade	Properties	Filtration Herzberg [s]	Retention of particles* [µm]	Weight [g/m²]	Thickness [mm]
Hardened highly pure filter papers	1573	fast	50	12 – 25	88	0,17
	1574	medium-fast	170	7 – 12	90	0,16
	1575	slow	600**	2	92	0,14
	1577	slow	650**	< 2	81	0,12

* Approximate values

** Measured with 150 mm water column instead of 50 mm

Applications

Grade 1573

- For coarse crystalline precipitates
- Iron hydroxide, aluminium, chrome, copper sulphate, bismuth, cobalt and iron
- Used as rolls for filtration of biosolids

Grade 1577

- For very fine precipitates
- Use in filter presses as protective paper

Grade 1574

- For fine crystalline precipitates
- Calcium oxalate, metal sulphide, barium sulphate and lead molybdate
- Emission controls on atmospheric pollution (sulphur oxide, ammoniac gases, etc.)

Grade 1575

- Retention of very fine precipitates, such as barium sulphate, zinc sulphide

Glass Fiber Filters

Recommended for controlling both air and water pollution.

- Made of 100% micro-borosilicate glass fibers
- Chemically stable in acidic solutions (except hydrofluoric acid) and alkaline solutions in moderate concentrations
- Extremely low metal content
- Maintains its properties up to 500°C (180°C for GF10)
- High flow speed and high permeability to air

Note on use and weight constancy:
No relevant changes in weight due to variations in the ambient humidity. Limited bending resistance: Brushing against other surfaces may cause the loss of fibers (keep the filters in their original box until their use).

Technical data - with binder

	Grade	Binder	Retention rate % NaCl-particle size <1 µm*	Filter class EN 779	Filtration Gurley [s]	Weight [g/m²]	Thickness [mm]	Maximum Temperature [°C]
Glass fiber filters	GF 6	inorganic	99,97	H14	40	80	0,35	500
	GF 8	inorganic	99		12	75	0,35	500
	GF 9	inorganic	99,97	U15	27	70	0,35	500
	GF 10	organic	99,97	H13	12	70	0,35	180

* Tested with NaCl particles size <1 µm, main fraction at 0,3 to 0,5 um

Technical data - without binder

	Grade	Air permeability* [L/m²s]	Retention rate % NaCl-particle size <1 µm***	Filter class EN 779	Filtration Gurley [s]	Weight [g/m²]	Thickness [mm]	Maximum Temperature [°C]
Glass fiber filters	GF 50	25	99,97	H14	19	56	0,29	500
	GF 51	11	99,993	H13	44	140	1,00	500
	GF 52	54*	99,995	U15	25	54	0,28	500
	GF 55	<10	99,999	U15	67	75	0,40	500

* According DIN 53887
** Air resistance in mbar at 400 cm³/s, A= 10 cm²
*** Tested with NaCl particles size <1 µm, main fraction at 0,3 to 0,5 µm

Applications

Grade GF 6

- Deposition of (radioactive) aerosols and monitoring of nuclear power plants
- Gravimetrical analysis of organic and inorganic impurities in water and waste water according to DIN 38409 and EN 872 (suspended particles). The integrated anorganic binder increases the stability without distorting the gravimetric result during annealing at 500°C in accordance with regulations
- Removal of proteins in beer samples prior to analysis
- Clearing of protein solutions prior to freeze-drying

Grade GF 8 and GF 9

- Measurement of emission, monitoring of the efficiency of filtration and dedusting, monitoring the combustion air of power plants and of the steel and iron industry
- Gravimetric measurement of dust release in workplace and production processes
- Measurement of the proportion of dust particles in technical gases
- Pre-filtration before use of membranes

Grade GF 10

- High mechanical stability
- Suitable as a roll filter in automatic air filter units and air analysers
- Deposition and measurement of soot, oil fume and suspended particles

Grade GF 50

- Water pollution analysis: Determination of suspended particles as per DIN 38409 and EN 872
- Biochemical issues like DNA, RNA, proteins and polysaccharides
- Determination of suspended particles (SPM and TSP) as per the directive of the US EPA
- Cleaning and buffering solutions and reagents for spectrophotometric measurements

Grade GF 51

- Biochemical issues like DNA, RNA, proteins and polysaccharides
- Membrane pre-filter to prevent silting
- Elimination of fine particles in solutions for analytical devices

Grade GF 52

- Determination of suspended particles as per European regulations EN 872 and/or standard method 2540 D
- Analysis of carbohydrates, cell cultures
- Scintillation count of DNA, RNA, proteins and polysaccharides
- Clearing of protein solutions prior to freeze-drying

Grade GF 55

- Sample and solvent filtration for HPLC
- Clarification and filtration of proteins, cell cultures, etc.
- Elimination of fine suspended carbon material in liquids to be filtered

Quartz Fiber Filters

Recommended filters for atmospheric pollution control and for particles determination at high temperatures.

- Filters made of pure quartz microfiber (SiO_2), free of binding elements or additives
- Ideally suited for trace analysis owing to extremely low metals content
- Excellent stability against chemical solvents, alkalis and acids, even in extreme conditions involving acidic gases (HCl, SO_2, SO_3, H_2SO_4, NO and NO_3); except hydrofluoric acid (HF)
- Usable in temperatures of up to 1000 °C

Technical data

	Grade	Weight [g/m²]	Thickness [mm]	TSI efficiency % [particles 0,3 µm]	Maximum Temperature [°C]	Binder
Quartz fiber filters	QFH	85	0,45	99,999	900	no

Applications

- Determination of suspended particles (SPM and TSP) in ambient air acc. to the directive of the US EPA (Environmental Protection Agency) and the EN 23210
- Applications that require a maximum filter purity with a low metal content and no carbon traces
- Filtration and analysis of both acid and alkaline gases and of solvents
- Emission: pollution controls performed on air within industrial stacks, smoke ducts and aerosols

Universal Filter Papers for Clarifying Filtration

Recommended for identification of substances, clarification of liquids and for the preparation of samples in a broad range of chemical analyses.

- Made of super-refined cellulose
- Three surfaces: smooth, grained, creped
- For quick separation of large to medium-sized particles
- Available as: plain and folded discs, sheets, cuts and rolls

Technical data

	Grade	Surface	Properties	Filtration Herzberg [s]	Retention of particles* [µm]	Weight [g/m²]	Thickness [mm]
Universal filter papers	1450nf	smooth	fast	50	15 – 25	118	0,30
	0860	smooth	medium-fast	120	7 – 12	74	0,17
	0859	smooth	medium-fast	150	7 – 12	61	0,14
	400	smooth	medium-fast	200	7 – 12	65	0,17
	0903	smooth	medium-fast	350	4 – 7	65	0,15
	0858	grained	medium-fast	110	7 – 12	75	0,17
	0905	creped	fast	40	12 – 25	74	0,27

* Approximate values

Applications

- Preparation of ordinary samples
- Clarification of:
  - Alcohols, essences, vinegar, essential oils, extracts
  - Electroplating baths, flotation sludge
  - Gelatin, glycerol, hair tonics, perfumes, tinctures
  - Paints, lacquers
  - Beer wort, spirits, syrups
  - Salt solutions
- Used as protection sheet of filter presses

Filter Papers for Technical and Industrial Use

We offer our customers in the manufacturing industries an ever-growing range of products. At present, our catalogue contains more than 150 types of technical paper for a wide variety of applications. Our industrial customers rely on our innovative energy and experience in the development process to produce the papers that are required for their production and as finished products for the customers‘ on going requirements. As a result, the Hahnemühle FineArt GmbH became contract manufacturer and important strategic partner for users of highly pure papers for filtration, as well as chemical and biological analyses.

The market sectors we supply with our technical specialty papers are equally as diverse and efficient as the properties of our papers. The purification and clarification of valuable liquids by using filter papers of consistent high quality are of high priority for several sectors. Customers working in medical engineering and diagnostics, general and luxury foodstock, chemical and pharmaceutical industries, recycling of oils and industrial liquids and electroplating, benefit from the consistent quality of our papers, which remains unchanged from batch to batch.

In addition to filtration, our highly refined filter papers are also valued on account of their absorptive properties. They are suitable as a carrier material for chemicals, a base material or a component of final products. They can also be used as a material in manufacturing other products. Sectors that rely on the properties of these papers include the electronics industry, solar cells manufacturing, adhesive tape manufacturing, medical technology and manufacturers of impregnated papers that emit specific substances to the environment in a controlled manner. Our references include global market leaders from various traditional and innovative branches of the manufacturing and processing industries.

We have developed different types of paper with special properties for a wide range of technical applications. They are well established in their respective fields and achieve optimal filtration.

- Produced from highly refined, natural cellulose and cotton linters, modified cellulose and synthetic fibers, glass microfiber or substitute materials or combinations thereof
- Two surfaces: smooth and creped papers
- Available as filter cards with a thickness of up to 2.1 mm and a weight of up to 850 g/m²

Technical data

	Grade	Properties	Filtration Herzberg [s]	Retention of particles** [µm]	Weight [g/m²]	Thickness [mm]
Smooth	1450nf	very fast, wet strength	50	12 – 15	118	0,30
	604L	fast	12 **	12 – 15	80	0,18
	598	medium-fast, thick	100	8 – 10	140	0,32
	3205	medium-fast	150	5 – 7	95	0,20
	3427	medium-fast, wet strength	26 **	5 – 7	100	0,20
	572	medium-fast, wet strength	160	5 – 7	125	0,28
	597L	medium-fast	170	4 – 7	81	0,17
	508	medium-fast, activated carbon	360	n/a	196	0,52
	BF	medium to slow, wet strength	300	4 – 6	135	0,26
	1577	very slow, very high wet strength, hardened filter	2000	≤2	82	0,12
Creped	520bII	very fast, wet strength, thick	30	15 – 19	135	0,50
	520b	very fast, wet strength, extra thick	30	16 – 20	155	0,65
	3144L	very fast, wet strength, extra thick	30 (4,2 **)	16 – 20	190	0,65
	520a	very fast, wet strength	35	15 – 18	90	0,32
	2772	very fast, wet strength	40	12 – 14	65	0,24
	2410	fast, wet strength	70	9 – 11	107	0,40
	2048	medium-fast, wet strength	135	5 – 8	149	0,65
Card	0048	Cellulose / Synthetic, low density, high break load	500 ***	n/a	130	0,68
	2282	fast, wet strength, thick	35	15 – 18	440	1,45
	2294	fast, wet strength, thick	55	8 – 15	570	1,50
	2208	fast, wet strength, thick	75 (12 **)	7 – 13	350	0,90
	2589a	medium-fast, wet strength	120	6 – 12	200	0,45
	5703	medium-fast, wet strength	120	6 – 12	240	0,55
	3605	medium-fast, wet strength	120	6 – 12	310	0,80
	2589b	medium-fast, wet strength	220	5 – 10	300	0,60
	2589c	medium to slow, wet strength	320	4 – 8	400	0,75
	22	medium to slow, wet strength, thin	350	3 – 8	180	0,35
	2589d	medium to slow, wet strength, thick	470	2 – 6	500	1,00
	2589e	slow, wet strength, thick	470	2 – 6	610	1,30
	8272	slow, wet strength, thick	600	2 – 4	707	1,50

* Approximate values
** Gurley
*** Air permeability at 50 Pa

Recommendation on Filter Papers for Special Applications

The selection of the right filter paper for the intended technical and industrial separation depends on many different factors: These include the volume and the size of the separated particles, volume and temperature of the liquid to filter, as well as the required precision of the filtration result. The individual demands on the filter paper can vary immensely. The chemical and physical nature of the sample has to be considered, as well as the further processing and analysis of the isolated precipitate or clarified filtrate.

Therefore a closer look into the aims and objectives of the filtration process should be completed before a filtration medium is selected. The following questions will help to find the best filter paper:

- What is filtered?
- Which kind of particles are in the liquid/air?
- What is the size of these particles?
- What shall be the maximum particle size in the resulting filtrate?
- What is the pH of the solution/gas?
- What is the temperature during the filtration process?
- Can the temperature be increased?
- What is the viscosity of the solution?
- What is the pressure during the filtration?
- Are the paper sheets mechanically supported in the filter press?
- What is the material of this support?
- How long does the filtration process take?
- How many grams of particle load per square meter of filter paper are expected?
- What additional demands are placed on the filter material?

The use of a special filter paper in certain filtration equipment usually requires a specific paper shape. Paper rolls with various width and lengths, filter circles with centre hole, large sheets with exactly positioned holes for the right fitting into a filter press and specific shapes with a flute or with pleats. All these conversions can be done with our own specific equipment. Please contact us!

Application	Smooth	Creped	Card
Separation of soot particles from air	604L, 597L		
Filtration of unsweetened juice, wine and spirits	572	2048	3605
Filtration of viscous liquids and emulsions (e.g. sweetened viscous juices, spirits and syrups, resin solutions, lacquers, essential oils, essences and plant extracts)	1450nf, 3205	520bII, 520b, 520a, 3144L	
Purification of electroplating baths		520b	2589a
Fine impurities in industrial liquids	1577, 3205	2772	5703, 2208, 2589a-d, 2294, 2282
Filtration of liquids, edible oils, transformer and turbine oils that are difficult to clarify	BF		22
Use in filter presses (protective paper)	1577	2410	
Filtration of tanning solutions and paints, vacuum and pressure filtration and lining larger suction filters	1577		2208
Boiler water filtration and filtration of active carbon particles			2589a-b
Determination of water uptake according to Cobb			5703
Monitoring dye stuffs in the textile industry	1450nf		
Centrifugation in cytological diagnosis			2589c, 2589d
Determination of the whiteness of milk, textile fibers	0048		

Low Nitrogen Filter Papers

Recommended for filtration of fine precipitates used for further analysis according to Kjeldahl.

- Filter paper made from carefully selected raw materials
- Extremely low content of nitrogen, approx. 0,24 mg / 240 mm disc

Applications

- Filtration of fine precipitates used to determine nitrogen content
- Determination of fine crystalline precipitates of sulphides of iron and steel alloys

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Low nitrogen filter paper	2095	slow	650	85	0,17

Kieselguhr (Diatomaceous Earth) Filter Papers

Recommended for filtration of the finest semi-colloidal turbidities.

- Medium to slow flow rate
- High absorption rate

Applications

- Clarification of extracts of soil suspensions, of milk serum, of starch solutions and sugar-containing solutions prior to polarimetry and refractometry
- For retention of protein precipitates and slime particles from solutions
- Clarification of urine samples

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Kieselguhr filter paper	287	medium to slow	660	154	0,36

Activated Carbon Filter Papers

Recommended for the adsorption of certain molecules in liquids and gases and for the removal of the finest, semi-colloidal turbidities.

- Medium flow rate
- High absorption rate
- Minimum of 35% content of activated carbon

Applications

- Clarification of extracts of soil suspensions, of milk serum, of starch solutions and sugar-containing solutions prior to polarimetry and refractometry
- Absorption of iodine 131 from air
- For filtration of electroplating baths

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Activated carbon filter paper	508	medium	360	196	0,52

Black Filter Papers

Recommended for the detection of very fine traces of light particles and precipitates.

- The filter paper grade 551 is a technical filter paper made with the addition of black dye
- White and light particles can be detected easily after filtration owing to the strong contrast to the black filter paper

Applications

- Detection of very fine traces of white precipitates and particles
- Detection of traces of silicone/fluorine traces (water drop test)
- Determination of the antiseptic effect of wood preservatives against fungal attack
- Visualisation of mycelial threads from fungi

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Black filter paper	551	slow, black	850	95	0,20

Filter Papers for Malt and Beer Analysis

Suitable for analytical methods in breweries to filter and analyse, based upon recommended procedures of the EBC (European Brewery Convention).

- Medium fast filter papers
- Ideal for clarification and sample preparation
- Useful to remove CO_2 and turbidities

For quantitative analysis in breweries, the types 589/1 and 589/2 are recommended. Technical features of both types are listed in the chapter “Ashless filter papers for quantitative analysis”.

Applications

- 2555: Sample preparation for extract determination of malt
- 595: Sample preparation and clarification
- 597: Removal of carbon dioxide and turbidity from cold trub; determination of coagulated proteins (nitrogen) and the grade of fermentation
- 602h: Removal of carbon dioxide and turbidity from beer

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Filter paper for malt and beer analysis	2555	medium, grained	110	75	0,17
	595	medium, smooth	140	68	0,15
	597	medium, smooth	160	85	0,18
	602h	slow, smooth	750	84	0,16

Filter Papers for Sugar Industry

Recommended for the clarifying filtration of beet extracts and juices prior to analysis.

- High filtration speed combined with high retention of particles
- Two surfaces are available: smooth or creped

Applications

- Clarification of dried beet pulp extracts
- Filtration of beet juice after addition of lead acetate for polarimetric sugar determination
- 3459 is recommended for Venema unit according to the sodium acetate method

Technical data

	Grade	Properties	Filtration Herzberg [s]	Weight [g/m²]	Thickness [mm]
Filter papers for sugar industry	3459	fast, creped	110	74	0,30
	3002	medium, smooth	150	61	0,14

Cellulose Extraction Thimbles

For reliable and fast analysis in the areas of food control and environmental monitoring. Suitable for Soxhlet-type, Tecator-type or similar devices, to extract certain components out of solid material with an appropriate solvent.

- Made of pure cellulose without added chemicals and a minimum amount of extractable components
- The consistent, high porosity of the thimbles ensures a rapid flow rate
- Wall thickness:
  - 1,3 mm in thimbles with ≤ 35 mm inner diameter
  - 1,7 mm in thimbles with > 35 mm inner diameter

The extraction thimbles are available in 2 versions:
type 900 for Soxhlet and similar extractors
type 901 for Tecator

Applications

- Extraction of fatty/greasy materials in foodstuffs, paints, varnishes and bituminous materials
- Analyses of pesticide waste, poly-aromatic carbohydrates and dioxins in foodstuffs
- Determination of oil content in oil-bearing seeds
- Extraction of active agents from pharmaceuticals and plastic softening agents

Technical data

	Grade	Type	Maximum Temperature [°C]	Binder
Cellulose thimbles	900	Soxhlet	130	no
	901	Tecator	130	no

Cellulose thimbles by Hahnemühle are the appropriate specimen holders for sophisticated quality control of solid and semi-solid substances. Extraction methods, for instance according to Soxhlet, Randall and Twisselmann, can be carried out with the versatile formats in which grade 900 is available. Their accuracy of fit and mechanical stability offer reliable handling. For Tecator equipment, Hahnemühle produces grade 901 thimbles with specific outside diameters. Modern, automatic extractors with high sample throughput and fast process flow can also be equipped with the Hahnemühle thimbles to ensure an excellent reproducibility of analysis results.

The ever increasing demands on analysis sensitivity are met by the thimbles that exhibit a minimal content of extractable substances. Only specially selected crude fibers that have been tested for extractable substances are used in production. Stringent criteria for approval by quality control guarantee constant values as far as dimensions, wall thickness and air permeability are concerned.

Glass Fiber Extraction Thimbles

Recommended for analysis of particles and aerosols in gases and air.

- Made of 100% pure borosilicate microfibers, without binding elements
- Wall thickness 1,5 mm (for thimbles with diameters < 33 mm)
- Good stability at high temperatures of up to 500°C in hot, humid or acidic gases

Applications

- Extraction of solvents which are incompatible with cellulose fibers
- Gravimetic collection of dust particles or aerosols from hot air and gas flows
- Extraction during special biochemical analyses

Technical data

	Grade	Retention rate %* (NaCl-particle size <1 µm)	Maximum Temperature [°C]	Binder
Glass fiber thimbles	CFV	>99	500	no

* Tested with NaCl particles size <1 µm, main fraction at 0,3 to 0,5 µm

Quartz Fiber Extraction Thimbles

Testing of highly acidic gases and air flows at very high temperatures is best performed with quartz fiber thimbles.

- Made of pure quartz micro fibers (SiO_2), free of binding elements or additives
- Extremely low content in alkali-earth metals
- Excellent retention of very fine particles < 1µm due to the adsorption mechanism of the quartz fibers: 99,99% TSI efficiency % (particle size 0,3 – 0,5 µm)
- Air permeability: extremely high. Able to pass through large volumes of air
- Chemical stability: excellent stability with virtually no loss of filter material due to chemical reactions, even under extreme conditions with acidic gases (HCl, SO_2, SO_3, H_2SO_4, NO and NO_3); except for hydrofluoric acid
- High resistance to solvents
- Higher temperature resistance than glass microfiber up to 1000°C

Applications

- Monitoring of gas emissions in high-temperature industrial furnaces
- Gravimetric determination of dust in very hot gases
- Collection of dust particles or aerosols from highly acidic air and gas flows

Technical data

	Grade	TSI efficacy % [particles 0,3 µm]	Maximum Temperature [°C]	Binder
Quartz fiber thimbles	CFQ	99,999	1000	no

Blotting Papers

Recommended for blotting techniques with gels.

- Made from ultrapure raw materials without additives
- No risk of contamination during the transfer steps of the membranes and gels
- High wet strength for safe handling

Applications

- Southern, Northern and Western blots; dot and slot blots
- Lifting of sequencing gels
- Lysis/denaturation of colony or plaque lifts

Technical data

	Grade	Properties	Surface	Thickness [mm]	Weight [g/m²]
Blotting papers	BP002	medium absorbency	smooth	0,35	192
	BP003	medium absorbency	smooth	0,90	320
	BP005	high absorbency	smooth	1,50	570

Antibiotic Test Papers

Recommended for identifying pathogens of infectious diseases by determining the degree of resistance against antibiotics as per the Hemmhof method.

- Made from ultrapure raw materials, entirely without additives
- No interference with the active substances during later incubation
- Consistent thickness ensures a constant absorption volume per disc

Applications

- The test discs are impregnated with antibiotics or chemotherapeutic agents, placed on the inoculated nutrient agar and incubated. The size of the inhibition zone is a measurement of the potency of the substances.

Technical data

	Grade	Weight [g/m²]	Thickness [mm]	Absorption* [µl]
Antibiotic test paper	22	180	0,35	70
	2668	320	0,90	215
	3324	280	0,73	220

* Measured with water, with 10 assay discs (6 mm in diameter).

Absorbent Protective Papers with Polyethylene Layer

This two-ply paper offers total protection of surfaces in the laboratory owing to its cellulose layer for liquid absorption and its waterproof polyethylene layer.

It has a cellulose layer of ultrapure filter paper that absorbs large volumes of liquid and a polyethylene layer that prevents liquids from reaching the protected surface

Applications

- Recommended as a base when working with valuable (precious metals) or dangerous substances (toxic, corrosive, radioactive, alkaline, acids, etc.)
- Hygienic coverage of surfaces in pathology, bacteriology and clinical and radiological laboratories
- Saturating the atmosphere in wet chambers (humidity controls)

Technical data

	Grade	Weight [g/m²]	Thickness [mm]	Water absorption [g/m²]
Protection paper	295PE	120	0,20	110

Chromatography Papers

Recommended for chromatographic analysis and preparations.

- Made from pure linters with an α-cellulose content of > 98%
- High-performance resolution and wet strength
- The fibers run in predominantly one direction
- Thicker papers allow higher sample volumes
- Lower capillary rises offer higher resolutions

Applications

Analytical work

- For most chromatographic work: type 2043a, type 2043b
- For evaluation by elution: type 2043b

Preparative work

- Work with larger volumes of substance: type 2668

The absorption is always greater along the linters fibers. The chromatography should be carried out along the direction of the fibers. This is indicated by the 570 or 600mm long edge of the sheet. Grades “a” and “b” differ in thickness only! The performance in resolution is the same. For two-dimensional chromatography the “b” grades are recommended.

Technical data

Filtre malzemesi	Grade	Properties	Weight [g/m²]	Thickness [mm]	Capillary rise* [mm]
Analytical chromatography paper	2043a	medium-fast	90	0,17	105
	2043b	medium-fast	125	0,22	105
Preparatory chromatography paper	2668	very fast	320	0,90	155 **
Chamber saturation paper	5703	medium-fast	239	0,55	–

* Measures in 30 min. ** Measures in 10 min.

Seed Germination Test Papers

Recommended for the reliable evaluation of seeds. All papers comply with ISTA requirements of 2017.

- All papers are made of pure cellulose and are free from mould, bacteria and any toxic substances which might interfere with the growth of seeds
- Sufficient moisture is stored for the whole duration of the test. The roots do not penetrate the paper
- The conductivity of the papers is lower than 40 mS/m^2 and the pH is between 6,0 and 7,5
- All seed testing papers meet the ISTA and AOSA requirements. Broad range of papers available for the various germination methods TP, BP and PP
- Pleated strips with exactly 50 double folds ensure optimal water supply and allow a simple identification of the individual seeds
- Coloured papers make it easier to see the delicate, white roots due to higher contrast. The dyes used do not affect seedling growth

ISTA methods

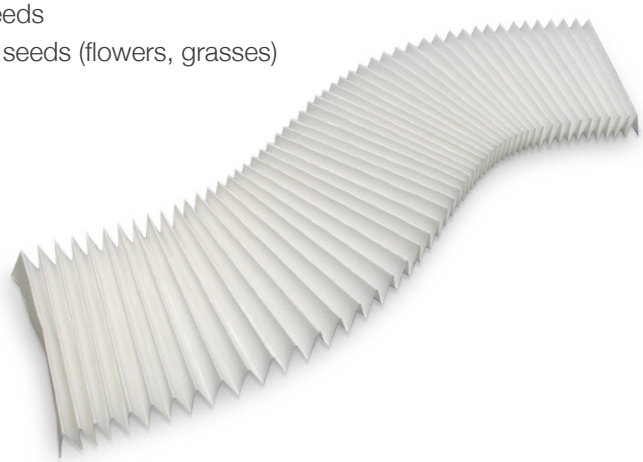
TP (top of paper): The seed is placed on one or more layers of paper and then allowed to germinate in a Copenhagen tank, petri dish or incubator.

BP (between paper): The seeds are placed between two horizontal layers of paper or are rolled up in vertical standing rolls of paper.

PP (pleated paper): The seeds are placed between the folds of a paper strip folded like a piano accordion. The pleated strips are placed in a plastic box and kept uniformly moist by a surrounding wrapping strip.

Applications

- Grade 3014, 3236 and, optionally, 0858: Medium large and coated seeds (sugar beet, fodder beet, grain, sunflower, rapeseed, mustard)
- Grade 3024: Sunflowers
- Grade 3621, 3633, 3645: Seeds with small, white rootlets
- Grade 520b, 5703: Grain (BP method)
- Grade 3014: Very sensitive seeds
- Grade 597, 598, 2048: Small seeds (flowers, grasses)



Technical data

	Grade	Properties	Weight [g/m²]	Thickness [mm]
Pleated Paper (PP) method	3014	Pleated strips, white	110	0,22
	3236	Pleated strips, grey	110	0,22
	0858	Wrapping paper for pleated strips	75	0,17

	Grade	Properties	Weight [g/m²]	Thickness [mm]
Top of Paper (TP) method	597	for petri dishes, Jacobsen Tank	85	0,18
	598	for petri dishes, Jacobsen Tank	140	0,32
	520bII	for petri dishes, Jacobsen Tank, Creped	135	0,53
	3024	White	150	0,35
	3621	Blotter, light blue	700	1,45
	3633	Blotter, light blue	300	0,65
	3644	Blotter, blue	720	1,42
	3645	Yellow	165	0,34

	Grade	Properties	Weight [g/m²]	Thickness [mm]
Between Paper (BP) method	520b	White	155	0,65
	5703	White	239	0,55

Weighing Papers

Its smooth surface guarantees the quantitative transfer of the material being weighed without any losses.

- Smooth and polished surfaces on both sides
- Removes the need to clean the trays
- It can be used instead of weighing boats

Applications

- Useful for weighing and handling of all kinds of solid samples

Technical data

	Grade	Weight [g/m²]	Thickness [mm]	Nitrogen content %
Weighing paper	360	25	0,02	0,04

Lens Cleaning Papers

Soft paper free of fibers is recommended for cleaning sensitive, optical surfaces.

- Fine, soft and white paper
- No release of fibers
- Silicone-free

Applications

- Cleaning optical lenses, trays, etc.
- As protective paper for microscopic and metallographic sections

Cellulose Acetate Membrane Filters

Recommended for aqueous samples, biological applications and protein filtration.

- Made entirely from pure cellulose acetate, hydrophilic
- High flow rate
- High thermal stability
- Very low non-specific adsorption
- Suited for use in pressure filtration devices
- Suitable for aqueous solutions with pH 4-8, most alcohols, hydrocarbons and oils
- Filter diameters from 25 mm to 50 mm
- Pore sizes 0,2 µm and 0,45 µm

Technical data

Material	Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
Cellulose acetate	0,2	120	>15	3,5
	0,45	120	>35	2,5

* as per DIN 53105
** as per DIN 58355: Average value per cm² area at Δp = 0,9 bar
*** as per DIN 58355

- Adsorption: bovine serum albumin < 10 µg/cm²
- Extractables with water less than 1%
- Sterilisation: by autoclaving at 121°C or 134°C, with γ-radiation, dry heat or ethylene oxide
- Temperature-resistant up to 180°C
- The resistance to various chemical solvents is summarised on page 72

Applications

- Filtration of aqueous solutions for biological and clinical analysis
- Sterilisation of biological solutions (CA-membranes with a pore size of 0,2 µm are specially recommended when the recovery of proteins is critical)
- Filtration of proteins and enzymes
- Biological and clinical analysis
- Sterilisation of culture media (0,2 µm)

Cellulose Nitrate Membrane Filters

Ideal for clarification and sterilisation of aqueous solutions, microbiological analysis and particle counts.

- Made of cellulose nitrate, hydrophilic
- High flow rate and high non-specific adsorption
- Suitable for aqueous solutions (pH 4-8), hydrocarbons and some diluted solvents
- Very uniform pore structure which ensures homogeneous distribution of the particles retained on the filter surface
- Extractables with water less than 1%
- Available in white or black, gridded (3,1 x 3,1 mm) or plain, sterile or non-sterile

Technical data

Material	Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
Cellulose nitrate	0,2	120	>10	2,7
	0,45	120	>20	2,0
	0,8	120	>40	1,0

* as per DIN 53105
** as per DIN 58355: Average value per cm² area at Δp = 0,7 bar
*** as per DIN 58355

- Adsorption: 160 µg/cm² for γ–globulin and pore 0,2 µm (decreases with increasing pore size)
- Extractables with water less than 1% to ensure sample purity
- No enhancement or inhibition by the grid lines, due to chemical extractables
- Temperature-resistant up to 130°C
- Sterilisation: by autoclaving at 121°C, γ-radiation (25 kGy) or with ethylene oxide
- The resistance to various chemical solvents is summarised on page 72

Applications

- The membranes with a pore size of 0,45 µm are used for micro-organism counts (microbiological analysis)
- Membranes with grid lines are ideal for microbiological analyses (bacterial counts) to detect E.coli, coliform bacteria and other germs in water, pharmaceuticals, beverages, cosmetics, etc.
- Sterilisation of solutions and culture media (0,2 µm) - Keep in mind binding of proteins!
- Pre-filtration, clarification, sterilisation of samples prior to further analysis
- Removal of particles in suspensions to determine the degree of impurity
- Measurement of sewage sludge in clarification plants (0.8 µm)
- Immunological analysis, which allow only a very low level of extractable substance in water
- Analysis of cell solutions

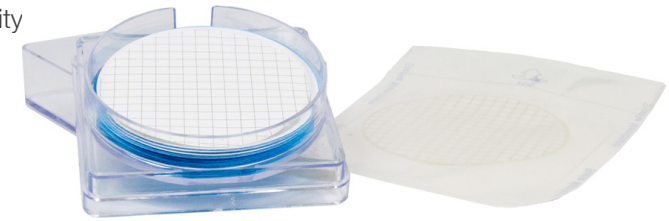
We offer the cellulose nitrate membranes in a broad range of various formats:

- White membranes, used in general laboratory applications
- Black membranes for counts of fungi and yeasts (the higher contrast enables easier counting)
- Gridded membranes (3.1 x 3.1 mm raster, black grid on white membrane or white grid on black membrane) for counts of colonies as a standard method of quantification
- Sterilised membranes (packaged in individual blisters) to ensure that the filter is not contaminated

Mixed Cellulose Ester Membrane Filters

Recommended for clarification and sterilisation of aqueous solutions, microbiological analysis and particle counts.

- Made of a blend of cellulose nitrate and cellulose acetate, hydrophilic
- High flow rate and high non-specific adsorption
- High mechanical stability
- Ideal for gravimetrical measurements, constant weight
- Extractables with water less than 1% to ensure sample purity
- Suitable for aqueous solutions (pH 4-8), hydrocarbons and some dilute solvents



Technical data

non-sterile membrane filters

Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
0,2	130	10	3,5
0,45	130	25	2,0
3	130	100	0,5
5	130	120	0,4
8	130	150	0,2

sterile membrane filters

Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
0,2	125	15	3,3
0,45	125	35	1,8

* as per DIN 53105
** as per DIN 58355: Average value per cm² area at Δp = 0,7 bar
*** as per DIN 58355

- Adsorption: 160 µg/cm² for γ–globulin and pore size 0,2 µm (decreases with increasing pore size)
- Sterilisation: by autoclaving at 121°C, γ-radiation (25 kGy) or with ethylene oxide
- Temperature-resistant up to 180°C
- The resistance to various chemical solvents is summarised on page 72

Applications

- The membranes with a pore size of 0,45 µm are used for micro-organism counts (microbiological analysis)
- Membranes with grid lines are ideal for microbiological analysis (bacterial counts) of water, pharmaceuticals, beverages, cosmetics, etc. for the measurement of coliform bacteria and other germs
- Sterilisation of solutions and culture media (0,2 µm) – Keep in mind binding of proteins!
- Pre-filtration, clarification, sterilisation prior to further analysis (0,45 µm)
- Gravimetrical measurements, removal of particles in suspensions to determine the degree of impurity (sewage plants etc.)
- Membranes with larger pore sizes (8 µm, 5 µm and 3 µm) are used for chemotaxis and retention of large cells

We offer a broad range of various formats:

- White membranes, used in general laboratory applications
- Gridded membranes (black grid on white membrane or white grid on black membrane) for counts of colonies as a standard method of quantification
- Sterilised membranes (packaged in individual blisters) ensure, that the filter is not contaminated.

Sterility Test: No growth was observed when sterilised samples were subjected to the Seven Day Sterility Test as described by USP

Microbial Test:
- Retention of 10^7 organisms/cm² Serratia marcescens ATCC 14756
- Recovery of Fecal Coliform > 90%

Nylon Membrane Filters

Recommended for filtration, sterilisation and clarification of mobile phase in HPLC processes with aqueous, alkaline and organic samples.

- Made entirely of polyamide (nylon), hydrophilic
- Suitable for many solvents and alkaline solutions, pH range 3-14
- High non-specific adsorption
- High mechanical stability

Technical data

Material	Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
Nylon	0,2	130	>4	3,1
	0,45	130	>16	1,5

* as per DIN 53105
** as per DIN 58355: Average value per cm² area at Δp = 0,9 bar
*** as per DIN 58355

- Adsorption: bovine serum albumin 100 µg/cm² (for 0,2 µm pore size)
- Extractables with water less than 1%
- Sterilization: by autoclaving (at 121ºC) or ethylene oxide
- Temperature-resistant up to 134ºC
- The resistance to various chemical solvents is summarised on page 72

Applications

- Particle removing filtration of water, and aqueous solutions and solvents for HPLC
- Isolating Legionella
- These filters are not recommended for applications like sterilisation of cell solutions as they can cause significant loss of tracers. For these applications, preference ought to be given to cellulose acetate (CA-) membranes, which have a low level of adsorption

PTFE Membrane Filters

Recommended for filtration and sterilisation of aggressive organic and inorganic solvents and samples and for venting.

- Made entirely of PTFE (polytetrafluorethylene), reinforced by Polypropylene net
- Permanently hydrophobic
- Allowing passage of air even at low differential pressure
- Resistant to almost all chemicals, very strong acids, cryoliquids, alkalis, aggressive organic solvents

Technical data

Material	Pore size [µm]	Thickness* [µm]	Flow rate** [ml/min]	Bubble pressure*** [Bar]
PTFE	0,2	160	>6	1,0
	0,45	160	>30	0,6
	5,0	180	>90	0,1

* as per DIN 53105
** as per DIN 58355: Average value per cm² area at Δp = 0,9 bar
*** as per DIN 58355 Isopropanol 60%

- Adsorption 8 µg/cm² for ɣ-globulin (pore size 0,2 µm)
- Extractables with water not detected
- Sterilisation: by autoclaving (at 121°C or 134°C) or by ethylene oxide
- Temperature-resistant up to 145°C
- The resistance to various chemical solvents is summarised on page 72

Applications

- Filtering chemically aggressive samples
- Clarifying corrosive substances, strong acids and alkalis (0,45 µm)
- Clarification of samples and mobile phases of HPLC (0,45 µm)
- Sterilisation of air and gases (0,2 µm)
- Separation of aqueous aerosols from gases
- Sterile venting of fermentation vessels, tanks and containers (0,2 µm)
- Must be pre-wetted with an organic solvent, such as ethanol, methanol or isopropanol, before filtration of aqueous samples

Cellulose Acetate Syringe Filters

Recommended for clarification, purification and sterilisation of aqueous solutions and biological samples.

- Cellulose acetate membrane, surfactant-free, hydrophilic
- Low non-specific adsorption (3,8 µg BSA/cm²)
- Perfect for aqueous solutions (pH 4 - 8) and the most of alcohols, carbohydrates and oils
- High flow rates:
  0,2 µm: 16,1 ml/min/cm²;
  0,45 µm: 54,7 ml/min/cm² (at 10 psi)
- Low dead volume
- Minimum of extractables
- Sterilisation by gamma irradiation or ethylene oxide, autoclaving is not recommended
- The resistance to various chemical solvents is summarised on page 74

Technical data

Material	Membrane Diameter	Case material	Fitting inlet	Fitting outlet	Filter area (cm²)	Sample volume (ml)	Hold up volume (µl)	Maximum pressure (bar)	Maximum Operating Temp. (°C)	Method of sterilisation
Cellulose acetate membrane	25 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	4,08	10-100	< 100	6	50	γ-irradiation
	30 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	5,39	>100	< 200	6	50	γ-irradiation

Applications

- Filtration of biological fluids, serum and nutrient media with a minimum loss of proteins owing to very low protein binding to the membrane
- Sterile filtration (0,2 µm) and clarification (0,45 µm) of nutrient media, biological fluids, cell solution, proteins, enzymes serum or additives
- Separation of virus/bacteria suspension (0,2 µm)
- Purification, particulate removal and clarification of liquids (0,45 µm)
- HPLC: Preparation of aqueous samples (0,45 µm)
- Clinical applications: Sterile filtration of injection solutions (0,2 µm)

Hahnemühle syringe filters are HPLC tested

Regenerated Cellulose Syringe Filters

High resistance during filtration and sterilisation of aqueous and organic samples in HPLC and GC applications.

- Regenerated cellulose membrane, hydrophilic
- Low protein adsorption
- High flow rate, high throughput volume
- Resistant to almost all solvents and aqueous solutions in pH range 3-12
- Sterilisation by gamma irradiation or ethylene oxide, autoclaving is not recommended
- Low dead volume
- Minimum of extractables
- The resistance to various chemical solvents is summarised on page 74

Technical data

Material	Membrane Diameter	Case material	Fitting inlet	Fitting outlet	Filter area (cm²)	Sample volume (ml)	Hold up volume (µl)	Maximum pressure (bar)	Maximum Operating Temp. (°C)	Method of sterilisation
Regenerated cellulose membrane	13 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	1,09	1-10	< 25	6	50	γ-irradiation
	25 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	4,08	10-100	< 100	6	50	γ-irradiation
	30 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	5,39	>100	< 200	6	50	γ-irradiation

Applications

- Filtration and clarification of small volumes of aqueous, organic and mixed solutions (0,45 µm)
- Sterilisation and clarification of cell and protein solutions and biological fluids without loss of proteins (0,2 µm)
- HPLC: Filtering aqueous and organic solutions prior to sample injection (0,45 µm)
- GC: Preparation of samples (0,45 µm)

Nylon Syringe Filters

Recommended for analytical applications, filtration of samples and solvents for HPLC under non-extreme conditions.

- Nylon membrane, hydrophilic
- Suitable for dilute organic solvents (such as acetone, methylene chloride and acetonitrile) and alkaline solutions
- Do not contain wetting agents
- High flow rate and high throughput volume
- Low dead volume
- Sterilisation by gamma irradiation or ethylene oxide, autoclaving is not recommended
- The resistance to various chemical solvents is summarised on page 74

Technical data

Material	Membrane Diameter	Case material	Fitting inlet	Fitting outlet	Filter area (cm²)	Sample volume (ml)	Hold up volume (µl)	Maximum pressure (bar)	Maximum Operating Temp. (°C)	Method of sterilisation
Nylon membrane	13 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	1,09	1-10	< 25	6	50	γ-irradiation
	25 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	4,08	10-100	< 100	6	50	γ-irradiation
	30 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	5,39	>100	< 200	6	50	γ-irradiation

Applications

- Filtration and clarification of small volumes prior to injection into HPLC system (0,45 µm)
- HPLC: Filtration of aqueous and organic solvents (0,45 µm)
- Sterilisation of aqueous and dilute organic solvents (0,2 µm)

PTFE Syringe Filters

Recommended for HPLC and GC samples, sterilisation and clarification of most solvents and filtration of gases and for air venting.

- Polytetrafluorethylene (PTFE, Teflon) membrane, hydrophobic
- Very high flow rate
- High chemical resistance to most solvents and acids
- Low dead volume
- Sterilisation by autoclaving at 121°C or by ethylene oxide
- Free from wetting agents
- They must be pre-wetted with a polar solvent such as ethanol or isopropanol before filtering aqueous samples
- The resistance to various chemical solvents is summarised on page 74

Technical data

Material	Membrane Diameter	Case material	Fitting inlet	Fitting outlet	Filter area (cm²)	Sample volume (ml)	Hold up volume (µl)	Maximum pressure (bar)	Maximum Operating Temp. (°C)	Method of sterilisation
PTFE membrane	13 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	1,09	1-10	< 25	6	50	γ-irradiation
	25 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	4,08	10-100	< 100	6	50	γ-irradiation
	30 mm	Polypropylene	Female Luer-Lock	Male Luer-Slip	5,39	>100	< 200	6	50	γ-irradiation

Applications

- Sterilisation (0,2 µm) and clarification (0,45 µm) of most acids and aggressive solvents
- Degassing solvents (0,45 µm)
- Venting of containers (0,2 µm)
- Sterilisation of air, gas and aerosol (0,2 µm)
- Tool for protection within vacuum pump (0,2 µm)
- Clarification of small volume samples for HPLC and GC applications, which require greater chemical resistance than regenerated cellulose syringes (0,45 µm)
- Excellent for the sterilisation and clarification of most solvents (such as acetone, dimethyl formamide or DMSO), and of very aggressive or acidic solutions
- Filtration and degassing of solvents prior to analysis (0,45 µm)

Owing to the colour code of Hahnemühles Syringe Filters, a mix-up can be excluded:
Orange = Cellulose Acetate
Light blue = Regenerated Cellulose
Blue = Nylon
Pink = PTFE

The Optimal Filter Paper for Every Application

Residue analysis

Quantitative analysis

Aequous solutions, very acidic / alkaline

Pressure / vacuum high

- Paper hardened quantitative
- Coarse precipitates (12–25 µm)*, fast: 1505
- Medium-fine precipitates (4–12 µm)*, medium: 1506
- Fine precipitates (≤ 2 µm)*, slow: 1507

Pressure / vacuum normal

- Glass microfiber
- Colloidal precipitate (1–3 µm)*t: GF 50-51-52-55, GF 6-10
- Colloidal precipitates (1–3 µm)*, extreme pH*: QFH

Aequous solutions, acidic / alkaline

Pressure / vacuum normal

- Paper quantitative
- Coarse precipitates (12–25 µm)*, fast: 589/1
- Medium-fine precipitates (4–12 µm)*, medium: 589/2
- Medium-fine precipitates (4–7 µm)*, medium: 589/4
- Fine precipitates (4 µm)*, medium: 589/5
- Very fine precipitates (2 µm)*, slow: 589/6
- Coloidal precipitates (1–2 µm)*, very slow: 589/3
- Precipitates with nitrates, slow: 2095

Glass microfiber

- Colloidal precipitates (1–3 µm)*: GF 50-51-52-55, GF 6-10

Air / Gases

Pressure / vacuum normal

- Glass / Quartz microfiber
- Colloidal precipitates (1–3 µm)*: QFH / CFV GF 6-10

Please use Quartz and Glass microfiber filter at high pressure with support only.

* Retention range are approximate values.

The Optimal Filter Paper for Every Application

Residue analysis

Qualitative analysis

Aequous solutions, very acidic / alkaline	Aequous solutions, acidic / alkaline
Pressure / vacuum high	Pressure / vacuum normal
Paper hardened qualitative	Paper qualitative
Coarse precipitates (12–25 µm)*, fast: 1573	Coarse precipitates (12–25 µm)*, fast: 604
Medium-fine precipitates (7–12 µm)*, medium: 1574	Medium-fine precipitates (7–12 µm)*, medium: 591, 598
Very fine precipitates (≤ 2 µm)*, slow: 1575, 1577	Medium-fine precipitates (4–7 µm)*, medium: 597, 595
	Fine precipitates (2–5 µm)*, medium: 593
	Very fine precipitates (2 µm)*, slow: 602h
	Colloidal precipitates (< 2 µm)*, very slow: 602eh

* Retention range are approximate values.

Please use Quartz and Glass microfiber filter at high pressure with support only.

The Optimal Filter Paper for Every Application

Filtrate analysis

Removal of particles (sample preparation)

Aequous solutions, very acidic / alkaline

Pressure / vacuum high

- Hardened qualitative paper
  - Coarse precipitates (12–25 µm)*, fast: 1573
  - Medium-fine precipitates (7–12 µm)*, medium: 1574
  - Very fine precipitates (≤ 2 µm)*, slow: 1575, 1577

Pressure / vacuum normal

- Glass microfiber
  - Colloidal precipitates (1–3 µm)*, medium: GF 51, GF 9
  - Colloidal precipitates (1–3 µm)* extreme pH,: QFH

Aequous solutions acidic / alkaline

Pressure / vacuum normal

- Paper qualitative
  - Coarse precipitates (12–25 µm)*, fast: 604
  - Medium-fine precipitates (7–12 µm)*, medium: 591, 598
  - Medium-fine precipitates (4–7 µm)*, medium: 597, 595
  - Fine precipitates (2–5 µm)*, medium: 593
  - Very fine precipitates (2 µm)*, slow: 602h
  - Colloidal precipitates (< 2 µm)*, very slow: 602eh
- Glass microfiber
  - Colloidal precipitates (1–3 µm)*, medium: GF 51, GF 9
- Paper general
  - Coarse precipitates (12–25 µm)*, fast: 1450nf, 0905
  - Medium-fine precipitates (7–12 µm)*, medium: 0860, 0859, 400, 0858
  - Fine precipitates (4–7 µm)*, medium: 0903

Please use Quartz and Glass microfiber filter at high pressure with support only.

* Retention range are approximate values.

Overview of Filtration Speed

	Technical Grade	Analytical Grade		Quality of the precipitate	
		Qualitative	Quantitative		
slow	287	602eh		colloidal	1 µm
		1577	589/3	very fine crystalline	
		602h, 1575	1507		
			589/6		
	2589d				
medium	0903, 2589c	593	589/5	fine crystalline	Particle size
	BF, 22				
	2589b				
	572	595, 1574	589/4, 1506		
	3605, 3205	597	589/2	medium-fine crystalline	
	0860				
	2529a, 2048				
	0858, 0859	591, 598			
fast	2208, 2294			coarse crystalline, flaky	
	2410				
	1450nf, 2282	604	589/1		
	2772, 0905	1573	1505		
	520a			gelatinous	
	3744L				
	520b, 520bII				25 µm

The relative position of the individual grades on the µm axis is to be understood as approximately instead of absolutely.

OEM/Private Label

A number of manufacturers and suppliers from different markets are choosing the high-quality papers from Hahnemühle when selecting their filter papers. Our many years of experience as a filter paper manufacturer and the quality of our products make us a qualified partner.

Supplement your high-quality product range with our reliable products. As an original equipment manufacturer, we are happy to cut papers to the customer's requirements – in the spirit of the "extended workbench". Our machinery allows us to respond flexibly to finishing requirements; we produce a variety of widths, lengths and formats, in accordance with your specifications.

We take the continuous monitoring of our production systems, narrow tolerances and unique quality just as much for granted as flexibility, customer service and delivery reliability. Our company structure allows us a quick response to customer requirements. All these factors make us an important OEM partner for industry.

Owing to the loyalty to the production site in Dassel, we have access to reliable and highly trained staff. Our customers, as well as our younger generation of employees, benefit from their experience. The interaction and cooperation of several generations is one of our strengths. With the knowledge of our employees and the impetus from our customers, we are constantly performing product optimisations and developing new products.

Please do not hesitate to contact us for further information.

Looking for an individual solution?

We would be pleased to develop a product which meets your exact requirements.
Contact us: +90 232 472 1711 or bilgi@elementel.com

Quality Management

Hahnemühle strives to offer products and services that consistently meet our customers' requirements and expectations. We use a strict quality management system to achieve this goal.

The DEKRA certification confirms that Hahnemühle complies with the standards of DIN EN ISO 9001. The use of our quality management system guarantees a high quality standard and a competitive position in international markets that have increasingly stringent quality requirements.

The certification further documents our intense customer focus, which covers every stage of the value chain from product development to the provision of services. Ongoing further product development and process improvements allow us to exceed the required quality standards.

Product manufacturers and quality assurance institutions must measure the performance and quality of a product in a wide range of applications in order to verify its suitability. ISO/EN standards, guidelines of shareholder associations, and state agencies specify the processes and tools for each application alongside the thresholds that must be observed. Hahnemühle filter papers provide a high degree of security.

Hahnemühle syringe filters and membranes are subject to stringent quality controls during and after production. The storage life of the finished products in the warehouse is constantly monitored. Each filter holder must also undergo the following five tests:
Bubble point, burst pressure, membrane absorption, flow rate and extractable substances.

Hahnemühle has been a "brand of the century" since 2016. It is part of the exclusive circle of Germany's strongest brands.

Criteria for Selecting the Right Filter Material for Filtration Processes Using Membranes and Syringe Filters

When choosing the optimal membrane, the pore size is a very important variable. Depending on the aim, you should select the best compromise between filtration speed and retention rate:

- 0.2 µm pore size for sterilising liquids and air
- 0.45 µm pore size for clarification or microbiological retention
- 0.8 µm and larger pore size for particle removal and monitoring

The composition of the ingredients of the filtered media must not change by filtration:

- Choose types of membranes with known low unspecific adsorption: cellulose acetate (AC), regenerated cellulose (CR)
- For diluted protein solutions, keep the membrane diameter to a minimum to further avoid adsorption

The syringe filter should not be decomposed by the used solvents:

The syringe filter should not be decomposed by the used solvents:
Please see the overview of chemical compatibilities of the several membranes and syringe filters on pages 72-75. To meet this need, we offer membranes with a broad range of chemical compatibility. All our membranes are made from low extractable polymers to ensure that your filtered solutions do not retain impurities nor any particles. Most of the syringe filters are built with a polypropylene housing, which can stand the use of the usual solvents.

The syringe filter must have an optimal ratio between speed and hold-up volume:

- We offer syringe filters with various diameters, from 13 mm to 30 mm

The high particle load of the sample may block the filter membrane or syringe filter:

- To avoid blocking the membrane, you should use a glass fiber filter as a pre-filter. The glass fiber filter GF9 is well accepted as a pre-filter for membranes to prevent the membranes from silting up. GF9 is available in different diameters: 50 mm and 90 mm. Order numbers: GF9050 and GF9090. Other sizes and special cuts are available on request.

The loss of expensive samples or media should be avoided:

- The design of our syringe filters features the lowest possible dead volume

Minimising the risk of mix-ups between syringe filters:

- Membrane type and pore size are printed on the housing of the syringe filter. The colour of the edges of the syringe filter stands for a particular type of membrane.

Please contact us, we are happy to advise you:
Telephone-Fax: +90 232 472 1711, bilgi@elementel.com

The Optimal Memrane & Syringe Filter for Every Application

Sample	Type of membrane		Benefits of the membrane type
Aqueous solution (hydrophilic)	AC	Cellulose Acetate	Very low protein binding
	NC	Cellulose Nitrate	Broad range of various pore sizes, high protein binding
	MCE	Mixed Cellulose Ester	Constant weight, used for gravimetrical analysis
Biological solution (hydrophilic)	AC	Cellulose Acetate	Very low protein binding

Sample	Type of membrane		Benefits of the membrane type
Aqueous/ organic solution (hydrophilic)	NY	Nylon (Polyamide)	Fast wetting, very high mechanical strength
Organic solution (hydrophobic)	PTFE	Polytetrafluorethylene	Used for very strong acids and bases
Gases, even strongly oxdidasing	PTFE	Polytetrafluorethylene	Used for very strong acids and bases

Test Methods

Ash content as per DIN 54370
Weighing the ash content of 10 g sample at 900°C (only quantitative and qualitative filter papers).

Separating performance as per BS 4400 (only for glass fiber filters)
Sodium chloride aerosols with a particle size < 1µm (maximum for 0.3 – 0.5 µm) are applied to a paper. Any aerosol passing through the paper is defined as photometric. Inflow velocity: 3 ml/min.

Breaking load (breaking resistance)
Stability property of a paper under tensile stress. A 15 mm wide and 100 mm long test strip is subjected to an increasing vertical load. The maximum force at the moment of tearing is the tensile strength. It is determined for the cross and machine direction of the paper.

Cobb Test (water absorption capacity, g/m²)
Test used to determine the amount of water absorbed after 10 minutes by the surface of a 100 cm² large test sample under pre-assigned conditions. EN ISO 535.

Thickness (mm)
Thickness is determined using a meter (test area = 2 cm²). As per EN ISO 534, the surface pressure averages 25 kPa

Iron (mg /100 g)
DIN 54374.

Grammage (g/m²)
A 100 cm² sample is weighed. EN ISO 536.

Gurley (s)
Time is recorded for 100 ml of air to pass through the sample at a certain pressure and 1.56 cm² sample area. ASTM-D 726.

Resins and oils (mg /100 g)
Determination of dichloromethane soluble matter. ISO 624.

Herzberg flow rate test (s)
Test to determine flow rate using 100 ml pre-filtered distilled water (20°C) applied to the test filter (effective area 10cm²) at a constant hydrostatic head.

Copper (mg /100 g)
DIN 54375.

Porosity (L/m² s)
Determination of apparent porosity with a pressure differential of 2 mbar and a test area of 20 cm². EN ISO 9237

Wet tensile (mm, water column)
Determined by continuously increasing a water column over a test area of 14,5 cm² until the paper bursts. Plant standard.

pH value – hot extract
A sample of 5 g is leached for 1 h with 250 ml of boiling distilled water and the pH value in the extract is measured using a glass electrode after cooling down to 20°C. DIN 53124.

Suction lift as per Klemm (mm)
Determination of capillary rise by measuring the wet part of a paper strip (15 x 250 mm) immersed in pre-filtered water (20°C) after 10 or 30 minutes. DIN ISO 8787.

Water absorption (g/m²)
Determination by differential weighing of a sample with a surface area of 100 cm².
(Weight 2 - weight 1) x 100 = water absorption.
Weight 1 = dry weight.
Weight 2 = weight after immersing the test sample in distilled water for 1 minute and removing the excess surface water.
Plant standard.

Whiteness (%)
Determination of CIE whiteness viewed under the CIE D65 daylight illuminant at an angle of 10°. λ = 460 nm.

Parameters and Testing Methods

Test Criteria	Description	Units
Pore size	One dry membrane filter and one wetted with a special liquid are subjected to continuously increasing pressure in a Coulter Porometer; in both cases the air flow through the membrane is measured.	µm
Bubble point DIN 58355 part 2 ASTM F 316	The membrane filter is wetted completely with water or isopropanol (PTFE membranes) and a continuously increasing pressure is applied to the inlet side until air bubbles appear at the outlet side. The bubble point correlates directly with the pore size and can be used to check the integrity of the filter.	bar
Water flow rate as per DIN 58355 part 1	The time taken for a certain amount of pre-filtered, deionised water (or ethanol for PTFE filters) to pass through the membrane filter is determined at a vacuum of 0.9 bar.	ml/min/cm2
Air flow rate	The time taken for the filtration of a defined volume of air (e.g. 100 ml) at a pressure of 3 mbar through a filter area of 6.45 cm^2.	ml/min/cm2
Thickness	The determination is carried out using callipers with 2 cm^2 jaws and a contact pressure of 0.1 bar (100 g/cm^2).	µm
Wetting	A membrane filter with a diameter of 50 mm is placed on water. The time taken for it to become completely wetted is measured.	s
Burst pressure DIN 53 141 part 1	A 10 cm^2 membrane sample is stretched over a rubber membrane. A constantly increasing force is applied and the pressure at the moment of bursting is measured.	bar
Extractable components (Weight loss) DIN 58 355 part 6	A membrane filter is weighed, placed in boiling water for 30 minutes, dried and then reweighed. The loss in weight is a measure of the extractable component fraction.	%
Bacterial challenge test DIN 58 355 part 3 ASTM D 3863 C	A medium containing test bacteria is filtered through the membrane filter (microorganism density 10^7 microorganisms/cm^3). After an incubation period of 72 hours the filtrate must show no signs of bacterial growth. Test bacteria: 0.15 µm - *Burkholderia cepacia* 0.2 µm - *Brevundimonas diminuta* 0.45 µm - *Serratia marcescens*	Optical evaluation (Turbidity)
Checking the sterilisation method with bio-indicators as per DIN 58 948 part 8	During the sterilisation process test strips with living bacterial spores are applied to the individually packed membranes. These are then incubated in a nutrient solution. After 7 days no turbidity (=bacterial growth) should be visible. Test spores: Ethylene oxide gas exposure: *Bacillus subtilis* γ-sterilisation: *Bacillus pumilus*	Optical evaluation (Turbidity)

Chemical Resistance – Membranes

Membrane	AC	NC	MCE	NY	PTFE
STERILISATION					
Ethylene oxide	++	++	++	++	++
Gamma irradiation	++	++	++	–	–
Autoclaving 121°C, 30 minutes	++	++	++	++	++
SOLVENTS					
Acetone	–	–	–	++	++
Acetonitrile	–	n/a	n/a	n/a	++
Gasoline	+	++	++	++	++
Benzene	+	++	++	++	++
Benzyl alcohol	–	+	+	++	++
N–Butyl acetate	–	–	–	++	++
n–Butanol	+	++	++	++	++
Cellosolve	–	–	–	++	++
Chloroform	–	++	++	++	++
Cyclohexane	+	+	+	++	++
Cyclohexanone	+	–	–	++	++
Diethylacetamide	–	–	–	++	++
Diethyl ether	+	–	–	++	++
Dimethyl formamide	–	–	–	+	++
Dimethylsulfoxide	–	–	–	++	++
Dioxane	–	–	–	++	++
Ethanol, 98%	+	–	–	++	++
Ethyl acetate	–	–	–	++	++
Ethylene glycol	+	+	+	++	++
Formamide	–	–	–	++	++
Glycerin	+	++	++	++	++
n–Heptane	+	++	++	++	++
n–Hexane	+	++	++	++	++
Isobutanol	+	+	+	++	++
Isopropanol	+	+	+	++	++
Isopropyl acetate	–	–	–	++	++
Methanol, 98%	–	–	–	++	++
Methyl acetate	–	–	–	++	++
Methylen chloride	–	+	n/a	++	++
Methyl ethyl ketone	–	–	n/a	++	++
Methyl isobutyl ketone	–	–	n/a	++	++
Monochlorobenzene	–	++	n/a	++	++
Nitrobenzene	–	+	n/a	+	++
n–Pentane	+	++	++	++	++
Perchloroethylene	–	++	++	++	++
Pyridine	–	–	–	++	++
Carbon tetrachloride	–	++	++	++	++

Chemical Resistance – Membranes

Membrane	AC	NC	MCE	NY	PTFE
Tetrahydrofuran	–	–	–	++	++
Toluene	+	++	++	++	++
Trichlorethane	–	++	++	++	++
Trichlorethylene	+	++	++	++	++
Xylene	+	++	++	++	++
ACIDS					
Acetic acid, 25%	+	+	+	–	++
Acetic acid, 80%	–	–	–	–	++
Hydrofluoric acid, 25%	–	+	–	–	++
Hydrofluoric acid, 50%	–	+	–	–	++
Perchloric acid, 25%	–	+	+	–	++
Phosphoric acid, 25%	+	+	+	–	++
Phosphoric acid, 86%	+	+	+	–	++
Nitric acid, 30 %	–	+	+	–	++
Nitric acid, 65 %	–	–	–	–	++
Hydrochloric acid, 15%	+	+	+	–	++
Hydrochloric acid, 20%	–	–	–	–	++
Sulfuric acid, 25%	–	–	+	–	++
Sulfuric acid, 98%	–	–	–	–	++
Trichloroacetic acid, 25%	–	+	+	–	++
BASES					
Ammonia, 1 N	–	++	++	++	++
Ammonium hydroxide, 25%	+	–	+	++	++
Potassium hydroxide, 25%	–	–	–	+	++
Sodium hydroxide, 32%	–	–	–	+	++
Sodium hydroxide, 1N	–	–	–	++	++
AQUEOUS SOLUTIONS					
Formalin, 30%	++	++	++	++	++
Sodium hypochlorite, 5%	–	+	–	–	++
Hydrogen peroxide, 35%	–	++	–	–	++
pH RANGE					
pH 1–14	–	–	–	–	++
pH 1–13	–	–	–	+	++
pH 3–14	–	–	–	+	++
pH 3–12	–	–	–	++	++
pH 4–8	++	++	++	++	++

Legend

compatible	++	not compatible	–
limited compatible	+	not analyzed	n/a

Contact time: 24 h at 20ºC
Chemical compatibilities can be influenced by various factors. Therefore, we recommend that you confirm compatibility with the liquid you want to filter by performing a trial filtration run before you start your actual filtration.

Chemical Resistance – Syringe Filters

Membrane		AC	CR	NY	PTFE
Housing	PP				
STERILISATION					
Ethylene oxide	++	++	++	++	++
Gamma irradiation	–	++	–	–	–
Autoclaving 121°C, 30 minutes	++	+	+	+	++
SOLVENTS					
Acetone	++	–	++	++	++
Acetonitrile	++	–	++	++	++
Gasoline	++	++	++	++	++
Benzyl alcohol	+	+	+	++	++
n–Butanol	++	+	++	++	++
Chloroform	++	–	++	++	++
Cyclohexane	+	+	+	++	++
Cyclohexanone	+	–	+	++	++
Diethylacetamide	++	–	++	++	++
Diethyl ether	++	+	++	++	++
Dimethyl formamide	+	–	+	+	++
Dimethylsulfoxide	++	–	++	++	++
Dioxane	++	–	++	++	++
Ethanol, 98%	+	+	+	++	++
Ethylene glycol	++	++	++	++	++
Glycerin	+	+	+	++	++
n–Hexane	+	+	+	++	++
Isopropanol	++	+	++	++	++
n-Propanol	++	+	++	++	++
Isopropyl acetone	++	+	++	++	++
Methanol, 98%	+	+	+	++	++
Methylene chloride	++	–	++	+	++
Methyl ethyl ketone	+	–	+	++	++
Methyl isobutyl ketone	+	–	+	–	++
Monochlorobenzene	+	+	+	++	++
Perchloroethylene	++	–	++	++	++
Propylene glycol	++	+	+	++	++
Pyridine	++	–	++	++	++
Carbon tetrachloride	–	–	–	++	++
Tetrahydrofuran	++	–	++	++	++
Toluene	++	–	++	++	++
Trichlorethylene	++	++	++	++	+
Xylene	+	++	+	++	++

Chemical Resistance – Syringe Filters

Membrane		AC	CR	NY	PTFE
Housing	PP				
ACIDS					
Formic acid	+	+	–	–	++
Acetic acid, 25%	+	–	+	++	++
Acetic acid, 80%	+	–	+	+	++
Phosphoric acid, 25%	+	–	–	–	++
Nitric acid, 25%	+	–	–	–	++
Hydrochloric acid, 25%	+	–	–	–	++
Sulfuric acid, 25%	++	–	+	–	++
Sulfuric acid, 98%	+	–	–	–	++
Trichloroacetic acid, 25%	+	–	+	–	++
BASES					
Ammonium hydroxide, 25%	+	–	+	++	++
Sodium hydroxide, 32%	+	–	–	++	++
AQUEOUS SOLUTIONS					
Formalin, 30%	+	+	+	++	++
Sodium hypochlorite, 5%	+	–	–	–	++
Hydrogen peroxide, 35%	++	+	–	++	++
pH RANGE					
pH 1–14	++	–	–	–	++
pH 1–13	++	–	–	–	++
pH 3–14	++	–	+	++	++
pH 3–12	++	–	++	++	++
pH 4–8	++	++	++	++	++

Legend

compatible	++	not compatible	–
limited compatible	+	not analyzed	n/a

Contact time: 24 h at 20°C
Chemical compatibilities can be influenced by various factors. Therefore, we recommend that you confirm compatibility with the liquid you want to filter by performing a trial filtration run before you start your actual filtration.

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