



Hahnemühle

*life science*

Industry & Laboratory | Product Profile & Application



## Preface

Dear customer,  
Dear partner,

You will already be familiar with our company and our centuries-long history. We laid the foundation for a successful business with the development of the first filter papers in 1883. 'True originals' such as 589/1, 595, 604, 1573 and GF10 have become firm fixtures of the filter market. As a manufacturer of high-purity filter media, we leverage our expertise to constantly refine our innovative filtration solutions for the life sciences sector, focusing specifically on the diagnostics, pharmacy, medicine, agritech and nutrition segments.

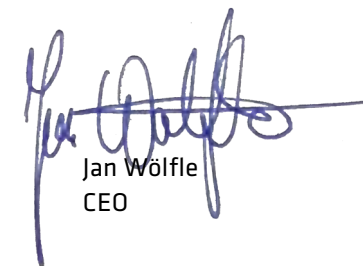
Our customers operate in highly sensitive markets that require reliable partners who are capable of adapting to changing framework conditions quickly. Thanks to our compact company structure, we can respond quickly and flexibly.

The COVID-19 pandemic also required us to face new challenges and explore new opportunities. As a manufacturer of high-tech filter media (a key component of rapid lateral flow and PCR tests used in testing for COVID-19) and a reliable partner to medical diagnostics, the biopharmaceutical industry and research, we've successfully kept our company on its toes throughout this challenging period.

We also quickly developed the HaMuNa® Care face mask made of high-purity filter paper and brought it to market at cost price. Since the end of 2021, our HaMuNa® Care product line has been expanded to include FFP2 and medical masks that offer excellent filtration performance. As with all Hahnemühle filter media, the HaMuNa® Care series is produced in Germany, which allows us to ensure a consistently high standard of quality, which is particularly vital in sensitive segments.

We also care deeply about sustainability, which is why we're working on various projects with our partners, including sustainable rapid antigen and antibody tests. We want to design diagnostic antigen and antibody POC tests, such as the coronavirus self-tests that are so indispensable in a pandemic, in an environmentally friendly manner in their entirety, without using any non-degradable components, while still offering high precision and a reliable diagnostic result. Our aim is to achieve sustainable growth in the healthcare and life sciences sectors and to continually bolster and expand our expertise as a leading manufacturer of high-performance filter media in the biotechnology and laboratory sectors.

Thanks to our expertise, our vision and, above all else, our employees, we're can look towards the future with confidence. We look forward to continuing our successful collaborative relationship. As ever, please do not hesitate to contact our team if you have any question.



Jan Wölflé  
CEO



## 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 fibre and quartz fibre raw materials are suitable for all laboratory and industrial applications.

Our portfolio includes:

- Filter papers made of cellulose, glass fibre and quartz fibre 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 fibre and quartz fibre
- Glass fibre papers for determining contamination in air and gases
- Germination test papers in accordance with ISTA requirements
- Blotting papers
- Chromatography paper
- Antibiotic test papers
- Papers for surface protection
- Papers for beer analysis

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

The microfiltration range includes syringe and membrane filters for reliably separating 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 unsterile membrane filters made of AC, NC, MCE, NY and PTFE

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



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## New releases



## Products by area of application



### Medical diagnostics:

Materials for producing rapid diagnostic tests and molecular biology tools are subject to very stringent requirements. Hahnemühle absorbent papers and glass fibre media guarantee both high and consistent performance. These papers are produced using the purest raw materials, thereby ruling out interactions with the reagents applied to the finished test strips.

- Cotton linters and glass fibre papers for diagnostic test strips
- Papers for impregnation, sample absorption and wicking



### Molecular biology:

Purifying and identifying biological material such as DNA, RNA, antibodies and so on is a key step in molecular biology tests. The production of tests for infections and allergies based on detection reactions with DNA, RNA, enzymes or antibodies on specimen carriers demands the utmost purity in the raw papers used for these highly sensitive test procedures, as well as a reliable yield.

- Glass microfibre papers for isolating DNA and RNA
- Quantitatively pure specimen carriers for detection reactions with enzymes or antibodies
- Blotting papers for protein identification after gel electrophoresis



### Microbiology:

Membranes are a valuable aid in detecting or cleaning microorganisms or particles. We offer an excellent range of syringe and membrane filters for reliably filtering liquids, air and other gases. The syringe filters are, of course, HPLC-tested and do not suffer from bleed.

- Sterile and unsterile syringe filters with CA, CR, NY and PTFE membranes
- Sterile and unsterile membrane filters made of AC, NC, MCE, NY and PTFE



### Pharmaceuticals:

Materials for producing pharmaceuticals and diagnostic chemicals are subject to very stringent requirements. Hahnemühle absorbent papers and glass fibre media guarantee both high and consistent performance. The purest raw materials are used to produce these filters, thereby ensuring as little contamination as possible.

- Filter papers for pharmaceutical quality control
- Wet-strength paper for filtering large volumes of biological fluids



### Environmental analysis:

An optimum filter material simplifies and supports contamination-free sampling of suspended particles in water and particles in emissions or chemicals. Thanks to their consistent performance, our high-purity filter papers are ideal for situations that call for unambiguous analytical results. Our filter papers are considered a reliable tool in all areas that are subject to strict official requirements (DIN, EPA, ASTM, etc.).

- Air pollution
- Emission control
- Water
- Waste products



### Food safety:

When it comes to quality assurance and raw material control, knowledge of ingredients is absolutely essential. Some of our high-quality filter grades have proven to be effective for analysis and strict monitoring work and are recommended by the Central European Commission for Brewing Analysis (MEBAK) in the publication 'Analytical methods in breweries – wort, beer and beer-based beverages'. Here, you will also find filter grades whose purity means they are suitable for process filtering foodstuffs and that offer certified conformity with US FDA recommendation 21 CFR and German Federal Institute for Risk Assessment (BfR) recommendations XXXVI and XXXVI/1.

- Fruit juice and nectar
- Wine and sparkling wine
- Beer, malt and beer-based beverages
- Edible and technical oils
- Sugar
- Milk and dairy products
- Meat and meat products



### Agriculture:

Detecting and determining nutrients and trace elements is essential for optimising crop and livestock growth. Our filter papers' average ash content has been adjusted to meet these high standards in chemical analysis.

The special conditions for germination testing are established by the stringent ISTA requirements. Hahnemühle germination test papers comply with these international requirements and permit reliable statements to be made regarding seed's germination capacity.

- Soil and fertiliser
- Animal feed
- Seed



### Chemicals:

Every chemical reagent and pharmaceutical substance is only as good as the quality of the product. Maximum quality standards are among the key success factors for any company operating in the chemical and pharmaceutical sector. Hahnemühle supplies the purest quantitative filter papers. With an average ash content ranging from 0.004% to 0.002%, they are the purest papers on the filter market!

- Quality control
- Detergents
- Oil refineries
- Cement analysis



### Technical special papers:

Our technical special papers have an enormous range of potential applications. As well as absorbing liquids and protecting sensitive surfaces, they can be coated with adhesives and polymers and used to reinforce packaging. They also absorb and re-emit fragrances, protect surfaces as an intermediate layer and can be formed into stable structures and impregnated, not to mention their ability to transport fluids and fragrances by capillary action, and much more besides...

- Surface protection
- Pipe sleeves
- Adhesive tape
- Fragrance cards



### HaMuNa® Care:

As an expert in high-quality filter components, Hahnemühle offers FFP2 masks and medical face masks with outstanding, verified filter performance as part of its HaMuNa® Care line. All HaMuNa® Care products are manufactured exclusively in Germany and tested according to European standards.

- HaMuNa® Care FFP2 mask
- HaMuNa® Care medical mask



## Medical diagnostics – point-of-care papers

Objectives in the production of dipsticks, lateral flow and flow-through tests for diagnostics in the point-of-care sector:

- Use of ultra-pure paper grades – linters and cellulose – without chemical additives to avoid interference in the detection reaction
- Homogeneous sheet structure with high hydrophilicity for consistent running characteristics in chromatography
- Use of papers and glass fibre media with high and consistent absorption capacity
- Some papers have a high wet strength for safe handling during reel-to-reel impregnation
- High consistency of paper quality – and particularly of thickness and capillary force – over the entire produced paper roll for reliable analysis results from one lot to the next
- Homogeneous dispersion of impregnation solutions
- High wet strength for safe handling during reel-to-reel impregnation

Hahnemühle absorptive papers are suitable for a multitude of diagnostic applications, such as:

- Screening for infectious diseases
- Pregnancy tests
- Drug screening
- Food and drink tests
- Environmental safety
- Veterinary diagnostics

We provide paper in the format you need!

| Process            | Water absorbency, g/100 cm <sup>2</sup> | Capillary rise (Klemm) | Grade    | Thickness |
|--------------------|-----------------------------------------|------------------------|----------|-----------|
| Impregnation       | 1.20                                    | -                      | 597 L    | 0.17 mm   |
|                    | 1.20                                    | 75 mm/10 min           | 597 nf * | 0.18 mm   |
|                    | 1.25                                    | 105 mm / 30 min        | 2043A    | 0.17 mm   |
|                    | 1.55                                    | 105 / 30 min           | 2043B    | 0.22 mm   |
|                    | 2.40                                    | 115 mm / 30 min        | 2316     | 0.30 mm   |
|                    | 2.5                                     | 150 mm / 30 min        | 7216     | 0.30 mm   |
|                    | 3.3                                     | 140 mm / 30 min        | 235L *   | 0.45 mm   |
|                    | 3.35                                    | 125 mm / 10 min        | 2992     | 0.47 mm   |
|                    | -                                       | -                      | 3605 *   | 0.8 mm    |
|                    | 7.40                                    | 155 mm / 10 min        | BP003    | 0.90 mm   |
| Absorption         | 8.0                                     | 95 mm / 10 min         | 3730     | 0.97 mm   |
|                    | 2.70                                    | 65 mm / 10 min         | BP002    | 0.35 mm   |
|                    | 7.40                                    | 155 mm / 10 min        | BP003    | 0.90 mm   |
|                    | -                                       | 170 mm / 30 min        | 2727     | 1.3 mm    |
| Sample collection  | 14.0                                    | -                      | BP005    | 1.5 mm    |
|                    | 1.20                                    | -                      | 597 L    | 0.17 mm   |
|                    | 3.35                                    | 125 mm / 10 min        | 2992     | 0.47 mm   |
| Sample application | 2.70                                    | 65 mm / 10 min         | 3469     | 0.35 mm   |
|                    | -                                       | 90 mm / 10 min         | GF 55    | 0.40 mm   |
|                    | -                                       | 130 mm / 10 min        | GF 51    | 1.0 mm    |
|                    | 1.25                                    | 105 mm / 30 min        | 2043A    | 0.17 mm   |
|                    | 1.55                                    | 105 / 30 min           | 2043B    | 0.22 mm   |
|                    | 2.5                                     | 150 mm / 30 min        | 7216     | 0.30 mm   |
|                    | 3.35                                    | 125 mm / 10 min        | 2992     | 0.47 mm   |
|                    | 7.40                                    | 155 mm / 10 min        | 2668     | 0.90 mm   |
|                    | -                                       | 170 mm / 30 min        | 2727     | 1.45 mm   |
| Conjugate release  | -                                       | 90 mm / 10 min         | GF 55    | 0.40 mm   |
|                    | -                                       | 130 mm / 10 min        | GF 51    | 1.0 mm    |

\* High wet strength

You will find suitable filter media on page 17 in the 'Pharmaceuticals' section for preparing larger quantities of biological materials by filtration.

Ordering information

All grades are available as rolls, sheets and custom cuts. Please don't hesitate to contact us for further details and advice.



## Molecular biology

Objectives in purifying and identifying biological material such as DNA, RNA, antibodies, etc.:

- Rapid isolation of DNA or RNA, e.g. from viruses such as SARS-CoV-2
- Sensitive detection of proteins, such as antibodies against bacteria and viruses, by blotting (Northern, Western and Southern blots)
- Easy production of diagnostic test systems for detecting infectious diseases via DNA, RNA or proteins
- Contamination-free specimen carrier for detection reactions with enzymes or antibodies (impregnation), e.g. allergy tests

For critical applications of this kind, the high-quality filter media from Hahnemühle offer:

- Absolute purity of the raw papers used for highly sensitive test procedures
- Reliable yield in the purification of DNA/RNA using glass fibre filters
- Good paper wet strength during blotting after gel electrophoresis

| Method                                                                                                                             | Filter characteristics                                                  | Filter grade                    |
|------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|---------------------------------|
| Separating and isolating DNA and RNA from the digestion of cells, bacteria, viruses, etc., by filtration (including by centrifuge) | Glass microfibre paper without binders                                  | GF 50, GF 51, GF 52             |
| Tests for infections and allergies by detection reactions with enzymes or antibodies on specimen carriers                          | Ultra-pure absorbent and homogeneous filter papers with no contaminants | 589/3, 2043A, 2043B, 7216       |
| Tests for viral and bacterial infections by blotting after gel electrophoresis                                                     | Ultra-pure, absorbent and wet-strength blotting papers                  | BP002, BP003, BP005, 3730, 2727 |

The absorbent blotting papers made of high-purity cotton linters contain no additives whatsoever, thereby preventing interference during the transfer steps and, where applicable, the drying process. The strict conditions as part of quality control ensure maximum homogeneity of sheet structure, not to mention consistency of performance from one lot to the next. As many of these papers are incorporated into in vitro diagnostics or other medical devices, we take care to ensure contamination-free handling during production. Otherwise, enzymes that break down nucleic acids or proteins could adversely affect the subsequent detection process.

We offer suitable filter media with a good flow rate and high strength for preparing large quantities of biological materials by filtration. We provide paper in the format you need!

| Production                             | Filter characteristics                  | Filter grade                      |
|----------------------------------------|-----------------------------------------|-----------------------------------|
| Filter presses, filtration of reagents | Creped, medium-fast                     | 2410                              |
|                                        | Filter card, medium-fast                | 3605                              |
|                                        | Fast – slow                             | 2589A, 2590B, 2590C, 2589D, 2589E |
|                                        | Hardened, fast, medium-fast             | 1573, 1574                        |
|                                        | Slow, very slow                         | 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                              |

### Ordering information

All grades are available as rolls, sheets and custom cuts. Please don't hesitate to contact us for further details and advice.



## Microbiology

Objectives in filtration with membranes:

- Filtering aqueous solutions for biological analyses
- Isolating microorganisms from fluids for identification and quantification
- Sterilising aqueous media and pharmaceutical solutions and mixtures
- Particle retention in aqueous solutions or air with subsequent gravimetric analysis
- Clarifying solutions prior to further analyses such as chromatography
- Removing particles from solvents or aqueous solutions

The various microfilter media from Hahnemühle offer numerous advantages:

- Fast filtration with a high flow rate
- Uniform distribution of pore size
- Low non-specific absorption
- Stable structure for problem-free gravimetric analysis

| Process                                                                                             | Filter characteristics                                             | Filter grade       |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|--------------------|
| Detecting and quantifying microorganisms                                                            | Cellulose nitrate membranes with grid, 0.2 µm and 0.45 µm, sterile | NCS 045, NCS 020   |
| Clarifying and sterilising biological fluids and culture media for biological and clinical analyses | Cellulose acetate membrane filters 0.2 µm and 0.45 µm              | AC 020, AC 045     |
| Analyses of cell solutions                                                                          | Cellulose acetate or nitrate membrane filters, 0.45 µm             | AC 045, NC 045     |
|                                                                                                     | Sterile syringe filters with cellulose acetate 0.2 µm and 0.45 µm  | SACS 020, SACS 045 |
| HPLC preparation of biological samples                                                              | Syringe filters with nylon                                         | SNY 020            |
|                                                                                                     | Syringe filters with regenerated cellulose                         | SCR 020            |
| Filtering the mobile, organic phase                                                                 | Nylon membrane, 0.2 µm                                             | NY 020             |

Ordering information

You can find part numbers for membrane and syringe filters on page 142. Other versions are available on request.



## Pharmaceuticals – Production and quality control

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 paper for quantitative analyses                                                                                      | 589/1 589/2<br>589/3 589/4<br>589/5 589/6  |
| Clarification of samples                                                               | Pre-filters for membranes                                         | Glass microfibre filters                                                                                                    | GF 9                                       |
| Microbiological analysis                                                               | Detection of microorganisms                                       | Cellulose nitrate membranes with grid, 0.45 µm and 0.2 µm, sterile                                                          | NCS 045<br>NCS 020                         |
|                                                                                        | Clarification of biological fluids                                | Cellulose acetate membrane filters, 0.2 µm and 0.45 µm<br>Sterile syringe filters with cellulose acetate 0.45 µm and 0.2 µm | AC 020, AC 045<br>SACS 045,<br>SACS 020    |
| Identification of pathogens/<br>resistance against antibiotics<br>or chemotherapeutics | Measurement of the inhibition<br>zone on inoculated nutrient agar | Cotton linters paper of highest<br>purity                                                                                   | 0.35 mm 22<br>0.90 mm 2668<br>0.73 mm 3324 |
|                                                                                        |                                                                   |                                                                                                                             |                                            |
|                                                                                        |                                                                   |                                                                                                                             |                                            |
| HPLC                                                                                   | Preparation of organic samples                                    | Syringe filters with nylon                                                                                                  | SNY 020<br>SCR 020                         |
|                                                                                        | Filtration of mobile phase                                        | Nylon membrane, 0.2 µm                                                                                                      | NY 020                                     |

| Production                             | Type of Filter                                     | Filter grade                     |
|----------------------------------------|----------------------------------------------------|----------------------------------|
| Filter presses, filtration of reagents | Creped                                             | medium-fast 2410                 |
|                                        | Filter card                                        | medium-fast 3605                 |
|                                        |                                                    | medium-fast - slow 2589A – 2589E |
|                                        |                                                    | fast, medium-fast 1573, 1574     |
|                                        | Hardened                                           | slow, very slow 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                       |                                  |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



## Food safety

### Fruit juice and nectar

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 paper for fast clarification of unsweetened juices                      | 0858                              |
|                                                                                                    |                                  | Filter paper for fast clarification of sweetened juice, viscous juice          | 0905                              |
|                                                                                                    |                                  | Filter paper for qualitative analysis, low ash according to § 64 LFBG          | 604, 597, 595<br>593, 602h, 602eh |
| HPLC                                                                                               | Clarification of aqueous samples | 0.2 µm cellulose acetate syringe filters<br>0.2 µm cellulose acetate membranes | SAC 020<br>AC 020                 |
|                                                                                                    | Clarification of organic samples | 0.2 µm nylon syringe filters<br>0.2 µm nylon membranes                         | SNY 020<br>NY 020                 |
|                                                                                                    | Filtration of mobile phase       | 0.45 µm nylon membranes                                                        | NY 045                            |
|                                                                                                    | Clarification of juices          | 0.45 µm cellulose acetate syringe filters<br>Cellulose acetate membrane        | SAC 045<br>AC045                  |
| Microbiological analysis                                                                           | Retention of microorganisms      | White, sterile membranes cellulose nitrate 0.2 and 0.45 µm, gridded            | NCS 045<br>NCS 020                |
|                                                                                                    |                                  | White, sterile membranes mixed cellulose ester, 0.2 and 0.45 µm, gridded       | MCES 045<br>MCES 020              |
| Spectrophotometry                                                                                  | Clarification of samples         | Glass microfibre filters                                                       | GF 6, GF 55                       |
| Preparing fruit juice samples for photometric measurements (e.g. phosphate) according to § 64 LFBG | Filtration (funnel/Büchner)      | Quantitative filter paper                                                      | 589/1                             |
| Protection of apparatus and surfaces                                                               | Absorption                       | Absorbent paper with polyethylene layer                                        | 295 PE                            |

| Production                          | Type of Filter                          | Filter grade        |
|-------------------------------------|-----------------------------------------|---------------------|
| Protective papers in filter presses | Medium-fast, wet strength, creped       | 2048, 2410, 2411    |
|                                     | 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                |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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

## Food safety

## Wine and sparkling wine

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to § 64 LFGB 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 paper                                                                            | 3469, 2043 a                        |
| Particle separation                                                     | Filtration (funnel/Büchner)                                | Filter paper for qualitative analysis                                                           | 604, 597, 595, 593 602, 602eh       |
|                                                                         | Preparation of samples (i.e. for L-Ascorbic acid analysis) | Grained paper for clarification of unsweetened juice                                            | 0858                                |
|                                                                         |                                                            | Creped filter paper for sweetened, viscous juice                                                | 0905                                |
|                                                                         | Separation of PVPP (E1202)                                 | Filter paper for clarification                                                                  | 400, 0858 as folded filters         |
|                                                                         | Separation of active carbon E1202)                         |                                                                                                 |                                     |
| Removal of CO <sub>2</sub> and turbidities from wine and sparkling wine | Removal of turbidity                                       | Low ash filter paper, Glass fibre                                                               | 602h, GF 20                         |
|                                                                         | Filtration                                                 | Hydrophilic Glass Fibre Filter                                                                  | GF 20                               |
| Gravimetric analysis                                                    | Measurement of ashes                                       | Filter paper 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, Degasing                                            | Pre-filtration                                             | Glass microfibre filters                                                                        | GF 20                               |

| Production                                                    | Type of Filter                    | Filter grade              |
|---------------------------------------------------------------|-----------------------------------|---------------------------|
| Clarification of sweetened, viscous wines<br>Papers and cards | Fast, wet strength                | 1450nf                    |
|                                                               | Medium-fast, wet strength         | 3205                      |
|                                                               | Creped, fast, wet strength        | 520a, 3144L, 520bII, 520b |
| Filtration of unsweetened wines                               | Fast, wet strength                | 572, 3205                 |
|                                                               | Grained, fast, wet strength       | 0858                      |
|                                                               | Creped, medium-fast, wet strength | 2048                      |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.

## Food safety

### Beer, malt and beer-based beverages

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to § 64 LFGB German law for food, feed and utensils
- Ideal for sample preparation and clarification. Useful for removing CO<sub>2</sub> and turbidities
- Measurement of nitrogen compounds, proteins and trace elements

| Process <sup>1)</sup>                                                          | Technique                    | Type of Filter                                                | Filter grade     |
|--------------------------------------------------------------------------------|------------------------------|---------------------------------------------------------------|------------------|
| Sample preparation for extract determination of malt                           | Filtration, funnel (Büchner) | Filter paper for clarification, grained                       | 0858, 2555       |
| Removal of CO <sub>2</sub> and turbidities from beer, wine and juices          |                              | Filter paper for qualitative analysis                         | 602h, 597, GF 20 |
| 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)                            |                              | Filter paper for quantitative analysis                        | 589/1            |
| Determination of nitrogen-compounds by phosphor molybdenum precipitation       |                              |                                                               | 589/2            |
| Determination of carbohydrates by hydrolysis                                   |                              |                                                               | 589/2            |
| Analysis of ash content in foodstuffs according to §35 LMBG                    | Filtration, funnel (Büchner) |                                                               | 589 /1           |
| Determination of proteins in wort and beer via MgSO <sub>4</sub> precipitation |                              |                                                               | 589 /1<br>589 /2 |
| Drinking water: Determination of chemical elements, radioactive trace elements | Filtration, funnel (Büchner) | Filter paper for quantitative analysis                        | 589/3            |
| Measurement of nitrogen                                                        | Quantification of nitrogen   | Weighing paper, 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          |

<sup>1)</sup> In the instructions in 'Analytical methods in breweries - Wort, Beer, beer-based Beverages', published by the Middle European Brewery Analysis Commission (MEBAK).

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.





## Food safety

### Edible oil and fat

Target application:

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

Process filtration:

- The papers listed are suitable for use in filter presses
- Clarification and purification of edible oils in line with the provisions of the German LFGB § 64
- Regeneration of lubricating oils, transformer and turbine oils
- Removal of turbidity and particles from used oil in fryers

| 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 paper for extra-fast filtration   | 3205, 1450nf |
|                                                      | Clarification of edible oils                  | Filter paper for very fine particles     | BF           |
| Analysis in line with § 64 LFGB                      | Filtration (funnel/Büchner)                   | Filter paper for qualitative analysis    | 604          |
| Determination of the unsaponifiable fraction in fats | Filtration (funnel/Büchner)                   | Filter paper for qualitative analysis    | 597, 595     |
| Analysis of oil/fats                                 | Fat extracting equipment                      | Filter paper with very high wet strength | 1574         |
|                                                      |                                               | Filter paper for quantitative analysis   | 589/5        |
| Quantifying particles using gravimetry               | Separation of solids in oil with petrol ether | Absorptive, dense paper                  | 602h         |
| HPLC                                                 | Clarification of organic samples              | 0.2 µm nylon syringe filters             | SNY 020      |
|                                                      |                                               | 0.2 µm nylon membranes                   | NY 020       |
|                                                      | Filtration of mobile phase                    | 0.45 µm nylon membranes                  | NY 045       |
| Protection of apparatus and surfaces                 | Absorption                                    | Absorbent paper with polyethylene layer  | 295 PE       |

| Production                                   | Type of Filter                      | Filter grade      |
|----------------------------------------------|-------------------------------------|-------------------|
| Clarification and Purification               | Fast, creped, for large particles   | 3144L, 2410, 2772 |
|                                              | 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.*

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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.

## Food saftey

## 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 paper                                                            | 3002               |
| Venema, sodium, lead acetate                          | Clarification before polarimetric determination of sugar | Fast, creped filter paper                                                        | 3459               |
| Gravimetry                                            | Filtration (funnel/Büchner)                              | Filter paper, quantitative analysis                                              | 589/1<br>589/2     |
| HPLC                                                  | Clarification of organic samples                         | 0.2 µm nylon syringe filters<br>0.2 µm nylon membranes                           | SNY 020<br>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<br>NCS 045 |
| Improvement in filtration<br>Clarification of samples | Pre-filters for membranes                                | Glass microfibre filters                                                         | GF 9               |
| Analysis of sucrose                                   | Clarification of samples of sugar syrup                  | 0.45 µm cellulose acetate syringe filters<br>0.45 µm cellulose acetate membranes | SAC 045<br>AC 045  |
| Protection of apparatus and surfaces                  | Absorption                                               | Absorbent paper with polyethylene layer                                          | 295 PE             |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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

## Food saftey

### Milk and milk products

Target application:

- Analysis of ingredients, contaminants and inspection of 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 paper for qualitative analysis                                 | 604, 595, 597       |
| Gravimetric analysis according to § 64 LMBG |                                  | Filter paper for quantitative analysis                                | 589/1, 589/2, 589/3 |
| Detection of metals in fats                 |                                  | Filter paper for clarification                                        | 0858                |
| Measurement of solids in suspensions        | Filtration, weighing             | Glass microfibre 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 fibres                          | 0048                |
| Protection of apparatus and surfaces        | Absorption                       | Absorbent paper with polyethylene layer                               | 295 PE              |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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



## Food safety

### Meat and meat products

Target application:

- Analysis of ingredients, contaminants and microbiological purity according to § 64 LFGB 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/Tecator | Cellulose extraction thimbles           | 900, 901                         |
| Gravimetry              | Filtration (funnel/Büchner)      | Filter paper for quantitative analysis  | 589 /1, 589 /2<br>589 /3, 589 /5 |
| Surface protection      | Absorption                       | Absorbent paper with polyethylene layer | 295 PE                           |
| Measurement of nitrogen | Kjeldahl weighing                | Weighing paper                          | 360                              |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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.

## 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 paper for clarification                         | 0858                                         |
| Measurement of nitrogen insoluble in water     |                                 | Filter paper for qualitative analyses, low ash content | 2095                                         |
| Measurement of nitrogen                        |                                 | Filter paper for quantitative analyses, ash-free       | 589/5                                        |
| Measurement of trace elements                  |                                 | Filter paper for quantitative analyses, ash-free       | 589/1, 589/2<br>589/3, 589/4<br>589/5, 589/6 |
| Free amino acids and total amino acids         | Water extraction                | Filter paper for quantitative analyses, ash-free       | 589/2<br>589/5                               |
| Measurement of soluble sulphates               |                                 | Filter paper for quantitative analyses, ash-free       | 589/3                                        |
| Determination of K and P                       |                                 | Filter paper, low phosphates                           | 589/1, 589/2<br>589/3, 589/4<br>589/5, 589/6 |
| Measurement of solids in suspension            | Filtration difference in weight | Glass microfibre 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 paper, low in nitrogen                        | 360                                          |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other 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 paper for clarification                                         | 0858         |
| Gravimetry                             |                                    | Filter paper for quantitative analysis                                 | 589/1, 589/2 |
|                                        |                                    |                                                                        | 589/3, 589/4 |
|                                        |                                    |                                                                        | 589/5, 589/6 |
| Measurement of Calcium                 |                                    | Filter paper for quantitative analysis                                 | 589/2        |
| HPLC                                   | Clarification of organic samples   | Syringe filters with nylon membranes or regenerated cellulose, 0.45 µm | SNY 045      |
|                                        | Filtration of mobile phase         | Nylon membrane, 0.45 µm                                                | NY 045       |
| Microbiological analysis               | Detection of microorganisms        | White cellulose nitrate membranes, 0.45 µm, gridded                    | NCS 045      |
| Separation of solids from sus-pensions | Filtration, weight determination   | Glass microfibre filters                                               | GF 52        |
| Surface protection                     | Absorption                         | Absorbent paper with polyethylene layer                                | 295 PE       |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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

## 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                                                                                                        |                                                                                                |                                                     |
|------------------|------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------------------------------------------|
| Seed germination | PP method<br>(pleated paper) | Germination test paper, pleated strips, white grey                             | 3014<br>3236<br>0858                                                                                                |                                                                                                |                                                     |
|                  |                              | Wrapping strips                                                                |                                                                                                                     |                                                                                                |                                                     |
|                  | TP method<br>(top of paper)  | Germination test paper as wrapping strips, for Jacobsen tank, for petri dishes | Thin, 81g<br>140g<br>Creped, 135g<br>Filter card, 700 g<br>Filter card, 300 g<br>Filter card, 720 g<br>165g<br>150g | 597<br>598<br>520bII<br>3621 light blue<br>3633 light blue<br>3644 blue<br>3645 yellow<br>3024 |                                                     |
|                  |                              | BP method<br>(between paper)                                                   | Germination test paper                                                                                              | 520b<br>5703                                                                                   |                                                     |
|                  |                              |                                                                                | Dust control                                                                                                        | Particle collection by dust meter                                                              | Glass microfibre filters with binder                |
|                  |                              | Prevention of penetration by roots, protection of surfaces                     |                                                                                                                     | Absorption                                                                                     | Absorbent paper with polyethylene layer on one side |

You can find parts numbers for pleated strips and cuts on page 138. Other formats such as rolls, sheets and cuts are available on request.

Further information on germination test papers can be found on page 101 “germ test papers”.



## Environmental analysis

### 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<br>TSP (Ø >30µm) <sup>1)</sup> | High volume capturer | Gravimetry                     | Glass microfibre filters, in line with US EPA                       | GF 50        |
|                                                                               | Low volume capturer  |                                |                                                                     | GF 50        |
|                                                                               | Cascade impactor     |                                |                                                                     | GF 50        |
| Sampling and analysis of PM10 (Ø > 10µm) <sup>1)2)3)</sup>                    | High volume capturer |                                | Quartz microfibre 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) <sup>1)</sup>                       | High volume capturer |                                | Quartz microfibre filters, in line with US EPA and DIN EN ISO 23210 | QFH          |
|                                                                               | Low volume capturer  |                                |                                                                     | QFH          |
|                                                                               | Cascade impactor     |                                |                                                                     | QFH          |
| Sampling and analysis of lead <sup>4)</sup>                                   | High volume capturer | Atomic absorption spectroscopy | Quartz microfibre filters, in line with US EPA and DIN EN ISO 23210 | QFH          |
|                                                                               | Low volume capturer  |                                |                                                                     | QFH          |
|                                                                               | Cascade impactor     |                                |                                                                     | QFH          |

You can find parts numbers for round filters and sheets on page 138. Other formats such as rolls and special cuts are available on request.

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 EN12341

3) Directive 2008/50/EC, in European standard EN12341.

4) Ambient air quality in accordance with EN 14902:2005

## Environmental analysis

### 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, grinders, 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) <sup>1) 2) 3) 4)</sup> | Isokinetic probe with rear filter-holder (up to 500°C)      | Filtration, weighing            | Glass microfibre filters<br>Glass fibre thimbles          | GF 50<br>CFV |
|                                                             | Isokinetic probe with front filter-holder (up to 900°C)     |                                 | Quartz microfibre filters<br>Glass fibre thimbles         | QFH<br>CFV   |
| Measurement of inorganic lead <sup>5)</sup>                 | Isokinetic probe with rear filter-holder (up to 500°C)      | Atom absorption spectroscopy    | Glass microfibre filters<br>Glass fibre thimbles          | GF 50<br>CFV |
| Measurement of metals <sup>6)</sup>                         | Isokinetic probe with rear filter-holder (up to 500°C)      |                                 | Glass microfibre filters<br>Glass fibre thimbles          | GF 50<br>CFV |
|                                                             | Isokinetic probe with front filter-holder (up to 900°C)     |                                 | Quartz microfibre filters<br>Glass fibre thimbles         | QFH<br>CFV   |
| Deposition of radioactive aerosols                          | Filtering instrument                                        | Filtration, Scintillation       | Glass microfibre filters, retention capability < 1µm      | GF6          |
| Monitoring the combustion air                               | Filtering instrument                                        | Filtration, weighing            | Glass microfibre filters                                  | GF8, GF9     |
| Monitoring particles in air and gases                       | Automatic air filter units, air analysers with filter rolls | Filtration, weighing            | Glass microfibre filters with high mechanical strength    | GF10         |
| Smoke test/house coal                                       | Portable measurement instrument                             | Filtration + optical evaluation | Fast, white filter paper, high air permeability           | 604L         |
| Emission test/engine development <sup>7)</sup>              | Automatic air filter units, air analysers with filter rolls | Filtration + optical evaluation | Medium-fast filter paper, small particle retention, white | 597L         |

You can find parts numbers for round filters and sheets on page 138. Other formats such as rolls and cuts are available on request.

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

**i** Glass and quartz fibre 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.

## Environmental analysis

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

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



**i** Glass fibre 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.

## Environmental analysis

### 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/cellulose nitrate  | AC 020<br>NC 020 |
|                                                    | Filtration (funnel/Büchner)         | Filter papers for clarification             | 0905             |
| Characterisation of toxic substances <sup>1)</sup> | Pressure filtration                 | Glass microfibre filters                    | GF 52            |
| Analysis of contaminated soil <sup>2)</sup>        | Extraction by water                 | 0.45 µm cellulose nitrate/cellulose acetate | NC 045<br>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 paper with polyethylene layer     | 295 PE           |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.

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.

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

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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.

## 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 paper 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       |
| Determination of tenside content    | Filtration (Funnel/Büchner)  | Glass microfibre filters               | 0860         |
| HPLC                                | Clarification of samples     | Syringe filters with nylon, 0.45 µm    | 0858         |
|                                     |                              |                                        | 0905         |
|                                     |                              |                                        | GF 50        |
| Separation of solids in suspensions | Clarification of samples     | Syringe filter, with nylon, 0.2 µm     | SNY 020      |
|                                     |                              |                                        | SNY 020      |
|                                     |                              |                                        | NY 020       |
| Surface protection                  | Filtration of mobile phase   | Nylon membranes                        | GF 52        |
|                                     |                              |                                        | GF 52        |
|                                     |                              |                                        | 295 PE       |
| Surface protection                  | Absorption                   | Glass microfibre filters               | 295 PE       |
|                                     |                              |                                        | 295 PE       |
|                                     |                              |                                        | 295 PE       |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other 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<br>(funnel/Büchner)                  | Filter paper for quantitative analysis               | 589/1 589/2<br>589/3 589/4<br>589/5 589/6  |
|                                                       |                                                 | Hardened filter papers for quantitative analysis     | 1505, 1506, 1507                           |
| Solid-liquid separation                               |                                                 | Folded filters for clarification                     | Smooth 0860<br>Grained 0858<br>Creped 0905 |
|                                                       |                                                 | Filter paper qualitative analysis, low ash           | 591                                        |
|                                                       |                                                 |                                                      |                                            |
| Extraction of organic compounds                       | Extraction with Soxhlet                         | Cellulose extraction thimbles                        | 900                                        |
| Determination of solids in suspen-<br>sions           | Filtration,<br>weighing                         | Glass microfibre filters                             | GF 52                                      |
| Surface protection                                    | Absorption of liquids                           | Absorbent paper with Polyethylene coating            | 295 PE                                     |
| Determination of particles with<br>diameter ≥ 0.8 µm  | Filtration, weighing                            | White, smooth cellulose nitrate membranes 0.8 µm     | NC 080                                     |
| Determination of particles with<br>diameter ≥ 0.45 µm |                                                 | White, smooth cellulose nitrate membranes<br>0.45 µm | NC 045                                     |
| Monitoring of soot in oil (OCM)                       | Dispersancy of the oil on absorp-<br>tive paper | Absorptive, dense filter paper                       | 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<br>1450nf |

You can find parts numbers for round and folded filters and membrane filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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.

## 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 paper |             | 100              | 3469  | 192           | 0.36           |
|                                                          |              |             |                  | 2589A | 200           | 0.45           |
| Building lime (DIN EN 459-2)                             | Filter card  |             | 190 x 190 sheets | 2727  | 700           | 1.3            |
| Mortar with binders containing minerals (DIN 18555-7)    | Filter card  |             | 190 x 190 sheets | 2727  | 700           | 1.3            |
| Blaine test (grinding fineness of cement (DIN EN 196-6)) | Filter paper | 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           |

You can find parts numbers for round and folded filters on page 138. Other formats such as rolls, sheets and cuts are available on request.



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.

## Technical special papers

In addition to filtration, our high-purity filter papers are also valued on account of their absorptive properties. They are suitable for use as a carrier material for chemicals, as a base material or as a component of final products – and they can also be used as a material in the manufacture of other products. Typical sectors that rely on the properties of these papers include the electronics industry, solar cell manufacturing, adhesive tape manufacturing and the production of impregnated papers. Our references include global market leaders from various traditional and innovative branches of the manufacturing and processing industries.

### Technical data

|                    | Grade   | Properties                  | Thickness [mm] | Weight [g/m²] | Gurley [s] | Breaking load [min. N/15 mm] | Wet strength [min. cm WS] | Capillary rise [mm/10 min] |
|--------------------|---------|-----------------------------|----------------|---------------|------------|------------------------------|---------------------------|----------------------------|
| Surface protection | 7192-90 | Smooth, sized               | 0.135          | 90            | -          | 70                           | -                         | -                          |
|                    | 7194    | Smooth, sized               | 0.5            | 350           | -          | 120                          | -                         | -                          |
| Adhesive tape      | 7204    | Wet strength                | 0.25           | 109           | 25         | 80                           | 150                       | 100                        |
|                    | 7206    | Wet strength                | 0.6            | 270           | 35         | 125                          | 150                       | 110                        |
|                    | 0905    | Wet strength, creped        | 0.27           | 74            | 40         | 16                           | 130                       | -                          |
|                    | 0859    | Wet strength, divisible     | 0.14           | 61            | 26         | 19                           | 130                       | -                          |
|                    | 0860    | Wet strength, divisible     | 0.17           | 78            | 20         | 22                           | 130                       | -                          |
|                    | 23      | Rapid absorption, printable | 0.45           | 240           | 135        | 110                          | 130                       | 85                         |
| Fragrance card     | 915/300 | Rapid absorption, printable | 0.45           | 300           | -          | 160                          | 130                       | -                          |
|                    | 7217    | Rapid absorption            | 0.25           | 220           | 1350       | 190                          | 130                       | -                          |
|                    | 2589C   | Rapid absorption, printable | 0.75           | 400           | 60         | 80                           | 130                       | -                          |
|                    | 2589D   | Rapid absorption, printable | 1.0            | 500           | 70         | 100                          | 130                       | -                          |

#### Ordering information

All grades are available as rolls, sheets and custom cuts. Please don't hesitate to contact us for further details and advice.



### Do you need customised product solutions?

We'll be happy to develop a product that is tailored to your requirements.  
Contact us now: +49 (0)5561 791 687 or [filtration@hahnemuehle.com](mailto:filtration@hahnemuehle.com)

#### Flexibility is a top priority for us!

We will develop a special formulation for you based on how you plan to use the paper. Through targeted pretreatment of the cellulose fibres and using a customised paper machine configuration, we can produce papers with your chosen properties. On request, we can also develop these customer-specific papers with a confidentiality agreement or provide you with exclusivity agreements. Our expertise enables us to produce papers with a wide range of different properties.

Examples include:

- Highly voluminous and thus highly absorbent papers
- Soft and smooth papers for surface protection
- High breaking load in the cross and machine direction
- High density and an even, compact structure
- Papers with high ageing resistance and light fastness for archiving
- Papers from 60 g/m² to 700 g/m² and with a thickness of 0.09 mm to 1.5 mm
- Made of high-purity cellulose, cotton linters and glass microfibres or mixtures thereof.
- Free of mineral compounds and heavy metals
- Acid-free, pH-neutral
- Photochemically inactive
- A variety of white tints or colours according to client specification
- Complies with the requirements of the BgVV in Recommendation XXXVI for food contact and with the stipulations of the FDA in 21 CFR Ch. 1 (1 April 2004 edition), § 176.170



Are you looking for a new paper for your application or an alternative supplier?  
We'll be happy to cater to your individual needs!

We are committed to providing our customers with papers that deliver maximum quality and continuity. We can also prepare a certificate of analysis (CoA) on request.

### OEM / private label

A number of manufacturers and suppliers from different markets opt for 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're happy to cut papers according to customer requirements – in the spirit of an 'extended workbench'. Our machinery allows us to respond flexibly to finishing requirements, and we produce a variety of widths, lengths and formats in accordance with your specifications.

Continuous monitoring of our production systems, tight tolerances and unique quality are a matter of course for us, as are flexibility, customer service and delivery reliability. Our company structure allows us to respond rapidly to customer requirements. It is by virtue of all these factors that we are an important partner for industry.

Thanks to our 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. With our employees' knowledge and impetus from our customers, we are constantly optimising existing products and developing new ones.



## HaMuNa® Care Schutzmasken – made in Germany

All HaMuNa® Care products are manufactured exclusively in Germany. Particularly in this sensitive area, this allows us to guarantee a high standard of quality.

### FFP2 half mask

The newly developed, highly efficient half mask from Hahnemühle is classed as personal protective equipment (PPE) and protects the wearer from particles, droplets and aerosols. As the air is filtered during both inhalation and exhalation, the mask protects other people too. This half mask provides the best protection in everyday settings such as public transport, supermarkets, schools, waiting rooms or public authority buildings.

Performance characteristics:

- Approval as PPE in accordance with DIN EN 149:2001 + A1:2009 – FFP2 NR
- Almost 98% filter efficiency against solid and liquid aerosols for optimum protection
- 'Covid Certified Filter (CCF) 0158 150 Nano' quality label (targeted test for the retention of coronaviruses)
- CE label

Characteristics:

- Lightweight, high-quality fabric, making the mask comfortable to wear
- Filter layer and outer and inner non-woven fabrics made of thermally bonded PP fibres
- Individually adjustable nose clip (HDPE-coated, galvanised wire) for significantly reduced fogging of glasses
- Elastic polyamide/elastane rubber bands
- Odourless materials



### Medical face mask

The new medical face mask covers the mouth and nose and is intended for use as a barrier to reduce the direct transmission of infectious droplets between staff and patients. It can also be worn in non-medical settings.

Approvals:

- EN 14683:2019 + AC:2019 – TYPE IIR medical face mask
- Outstanding bacterial filtration efficiency  $\geq 98\%$
- CE label

The components ensure that the mask is comfortable to wear:

- Three non-woven layers of particle-filtering, thermally bonded polypropylene fibres:
  - Outside: spunbonded PP fabric
  - Inside: non-woven PET/PP fabric, making the mask comfortable to wear
  - Filter layer: melt-blown, non-woven PP fabric
- Individually adjustable, galvanised nose clip (0.5 mm thick) – ideal for people who wear glasses
- Rubber bands made of polyamide and elastane
- Odourless materials

Ordering information

Order numbers from page 138 onwards.

FFP2 mask 25 units/pack, medical face mask 50 units/pack



## Products by properties



### Ashless filter papers

Quantitative analyses, routine gravimetric tests and preparing samples for instrumental analysis page 61



### Hardened, ashless filter papers

Pressure filtering acidic and alkaline solutions for quantitative analyses page 63



### High-purity filter papers

Determining substances and preparing samples for sensitive, qualitative detection methods page 65



### Hardened, high-purity filter papers

Pressure filtering acidic and alkaline solutions for qualitative analyses page 69



### Glass fibre filters – with binders

Controlling air and water pollution page 71



### Glass fibre filters – without binders

Controlling air and water pollution page 71



### Quartz fibre filters

Atmospheric pollution control and particle determination at high temperatures page 75



### Universal filter papers for general laboratory work

Suitable for clarifying liquids and preparing samples page 77



### Technical filter papers for industry

Cellulose and linter papers with different surfaces and grammages page 78



### Low-nitrogen filter paper

Recommended for filtering fine precipitates to determine the nitrogen content page 83



### Kieselguhr filter papers

For separating the finest, semi-colloidal turbidities page 83



### Activated carbon filter paper

Removing the finest, semi-colloidal turbidities page 85



### Black filter paper

For detecting very fine traces of bright particles and precipitates page 85



### Filter papers for malt and beer analyses

Recommended for preparing samples in the brewing industry page 87



### Filter papers for the sugar industry

Clarifying filtration of beet extracts and juices prior to analysis page 87



### Cellulose extraction thimbles

For food and consumer goods control, as well as environmental monitoring page 89



### Glass fibre thimbles

Determining dust and aerosols in hot air page 91



### Blotting papers

Recommended for various blotting techniques after electrophoresis page 93



### Antibiotic test papers

For checking the effectiveness of antibiotics against pathogens of infectious diseases page 95



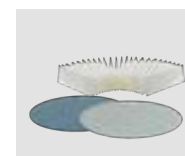
### Absorbent paper with polyethylene layer

Effective and waterproof protection for work surfaces page 97



### Chromatography papers

For chromatographic analyses and preparations page 99



### Germination test papers

Recommended for reliably evaluating seeds in accordance with ISTA requirements page 101



### Weighing paper

Smooth, polished surface on both sides page 103



### Lens cleaning paper

Cleaning sensitive, optical surfaces page 103



### Cytocentrifuge papers

Highly absorbent papers, centrifuging cells and tissues page 105



### Drying pad

Absorbent paper for microscopy page 105



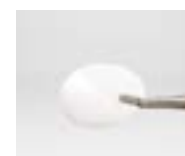
### Cellulose acetate membrane filters

Ideal for aqueous samples, biological applications and protein filtration page 107



### Cellulose nitrate membrane filters

For clarifying aqueous solutions and for microbiological analyses page 109



### Mixed cellulose ester membrane filters

Ideal for clarification and sterilisation, hydrophilic page 111



### Nylon membrane filters

Chemically stable membrane for preparing samples page 113



### PTFE membrane filters

Membrane with very high chemical resistance and high mechanical strength page 115



### Cellulose acetate syringe filters

High flow rates, also available sterile page 117



### Syringe filters with regenerated cellulose

Low protein adsorption page 119



### Nylon syringe filters

High resistance in HPLC and GC applications page 121



### PTFE syringe filters

High chemical resistance, hydrophobic page 123

### Product selection

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### Quality and test methods

Quality concept and test criteria page 130

### Chemical resistance

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Part numbers page 143

## Ashless filter papers for quantitative analysis

Ashless filters (approx. 0.004 %), recommended for quantitative analyses, routine gravimetric tests and sample preparation for instrumental analyses

- 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

### Technical data

| Type             | Properties           | Filtration Herzberg [s] | Retention of particles * [µm] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|------------------|----------------------|-------------------------|-------------------------------|----------------------------|----------------|
| ● 589/1 – black  | fast                 | 50                      | 12 – 25                       | 79                         | 0.19           |
| ○ 589/2 – white  | medium-fast          | 140                     | 4 – 12                        | 85                         | 0.18           |
| ● 589/4 – yellow | medium-fast, low-fat | 170                     | 4 – 7                         | 81                         | 0.17           |
| ● 589/5 – red    | medium-fast          | 450                     | 2 – 4                         | 84                         | 0.17           |
| ● 589/6 – green  | slow, thin           | 900                     | 2                             | 74                         | 0.15           |
| ● 589/3 – blue   | slow                 | 750 **                  | < 2                           | 84                         | 0.16           |

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

### Applications

#### Grade 589/1 – black

- 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 589/3 – blue

- 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

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

#### Grade 589/2 – white

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

#### Grade 589/4 – yellow

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

#### Grade 589/6 – green

- For fine crystalline precipitates.
- CaC<sub>2</sub>O<sub>4</sub>, PbSO<sub>4</sub>, BaSO<sub>4</sub> (hot-felled precipitates)

The types 589/1 to 589/6 are available as filter circles with the following sizes. Order numbers from page 134. Other sizes, folded filters, sheets and special cuts are available on request.



## Hardened, ashless filter papers

Hardened, ashless filter papers (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

| Type | Properties  | Filtration Herzberg [s] | Retention of particles * [µm] | Weight [g/m²] | Thickness [mm] |
|------|-------------|-------------------------|-------------------------------|---------------|----------------|
| 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 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 analyses of fine metals: barium and lead sulphate, nickel and tin sulphide, oxalate and calcium fluoride

### Ordering information

The types 1505 to 1507 are available as filter circles in various sizes. Order numbers from page 134. Other sizes, folded filters, sheets and special cuts are available on request.



## 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 pressure and aggressive chemicals (types: 1573, 1574, 1575, 1577)

### Technical data

| Type  | Properties           | Filtration Herzberg [s] | Retention of particles * [µm] | Weight [g/m²] | Thickness [mm] |
|-------|----------------------|-------------------------|-------------------------------|---------------|----------------|
| 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                        | 139           | 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 150 mm water column instead 50 mm

### Ordering information

Types 591, 593, 595, 597, 597L, 598, 602h, 602eh and 604 are available as filter circles and folded filters in various sizes. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.



**i** Made from the same raw materials as the quantitative filter papers: Refined cotton linters and cellulose with an  $\alpha$  cellulose content of up to 98%. This gives the filter papers a high degree of stability and durability.

## Highly pure filter papers for qualitative analysis

### Applications

#### Grade 604

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

#### Grade 597

- For medium-fine, crystalline precipitates
- Calcium oxalate, metal sulphide
- Determination of the fat content of foods as per §64 LF BG (folded) and in milk and dairy products as per DIN 10342
- Preparation of samples and removal of CO<sub>2</sub> 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 LF BG (folded)
- Determination of the unsaponifiable fraction in fats and oils
- Digestion of solids with aqua regia e.g. for ICP/AAS analysis (folded)

#### 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<sub>2</sub> in the beverage industry, recommendation by the European Brewery Convention/MEBAK

#### 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 598

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

#### Grade 597L

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

#### Grade 593

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

#### Grade 602eh

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



## 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  $\alpha$  cellulose content up to 98%, therefore high stability and durability

### Technical data

| Type | Properties  | Filtration Herzberg [s] | Retention of particles * [ $\mu$ m] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|------|-------------|-------------------------|-------------------------------------|----------------------------|----------------|
| 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 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 1575

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

### 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 1577

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

### Ordering information

The types 1573, 1574, 1575 and 1577 are available as filter circles in various sizes. Order numbers from page 134. Other formats, folded filters, sheet material, rolls and special cuts are available on request.

## Glass fibre filters

Recommended for controlling both air and water pollution

- Made of 100% micro-borosilicate glass fibres
- 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
- 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 fibres (keep the filters in their original box until ready to use).

### Technical data – including binder

| Type  | Binder           | Retention rate %<br>NaCl-particle size <1 µm* | Filter grade<br>DIN EN 1822-3 | Filtration Gurley<br>[s] | Weight<br>[g/m²] | Thickness<br>[mm] | Max T<br>[°C] |
|-------|------------------|-----------------------------------------------|-------------------------------|--------------------------|------------------|-------------------|---------------|
| GF 6  | inorg.           | 99.97                                         | H14                           | 40                       | 80               | 0.35              | 500           |
| GF 8  | inorg.           | 99                                            |                               | 12                       | 75               | 0.35              | 500           |
| GF 9  | inorg.           | 99.97                                         | U15                           | 27                       | 70               | 0.35              | 500           |
| GF 10 | org. hydrophobil | 99.97                                         | H13                           | 12                       | 70               | 0.35              | 180           |
| GF 20 | org. hydrophilic | 99.99                                         | -                             | 15                       | 86               | 0.50              | 180           |

\* Tested with NaCl particles size <1 µm, main fraction at 0.3 to 0.5 µm

### Technical data – excluding binder

| Type  | Air permeability*<br>(Resistance** mbar)<br>[L/m²s] | Retention rate %<br>NaCl-particle size<br><1 µm*** | Filter grade<br>EN 779 | Filtration Gurley<br>[s] | Weight<br>[g/m²] | Thickness<br>[mm] | Max T<br>[°C] |
|-------|-----------------------------------------------------|----------------------------------------------------|------------------------|--------------------------|------------------|-------------------|---------------|
| 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           |

\* as per DIN EN ISO 9237

\*\* Air resistance at 400 cm³/s, A = 10 cm²

\*\*\* Tested with NaCl particles size <1 µm, main fraction at 0.3 to 0.5 µm

Ordering information:

Types GF 6 to GF 55 are available as filter circles in various sizes. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.

## Glass fibre filters

### Applications

#### Grade GF 6

- Deposition of (radioactive) aerosols and monitoring of nuclear power plants
- Gravimetric analyses 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 10

- High mechanical stability
- Because of the hydrophobic binding, no humidity will be absorbed and there are no weighing errors
- 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 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 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 20

- The hydrophilic character enables rapid filtration of aqueous solutions
- Ideal for rapid clarification and degassing of carbonated drinks

#### 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 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 fibre filters

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

- Filters made of pure quartz microfibre (SiO<sub>2</sub>), 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<sub>2</sub>, SO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, NO and NO<sub>3</sub>); except hydrofluoric acid (HF)
- Usable in temperatures of up to 1000 °C

### Technical data

| Type | Weight [g/m <sup>2</sup> ] | Thickness [mm] | TSI efficiency % [particles 0.3 µm] | Air permeability [l/m <sup>2</sup> sec] | Max T [°C] | Binder |
|------|----------------------------|----------------|-------------------------------------|-----------------------------------------|------------|--------|
| QFH  | 90                         | 0.5            | 99.97                               | 16                                      | 950        | 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

### Ordering information

The type QFH is available as a filter circle in various sizes. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.



## Filter papers for clarification

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

| Type   | Surface | Properties  | Filtration Herzberg [s] | Retention of particles * [µm] | Weight [g/m²] | Thickness [mm] |
|--------|---------|-------------|-------------------------|-------------------------------|---------------|----------------|
| 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   | crêped  | fast        | 40                      | 12 – 25                       | 74            | 0.27           |

\* Approximate values

## Applications

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

### Ordering information

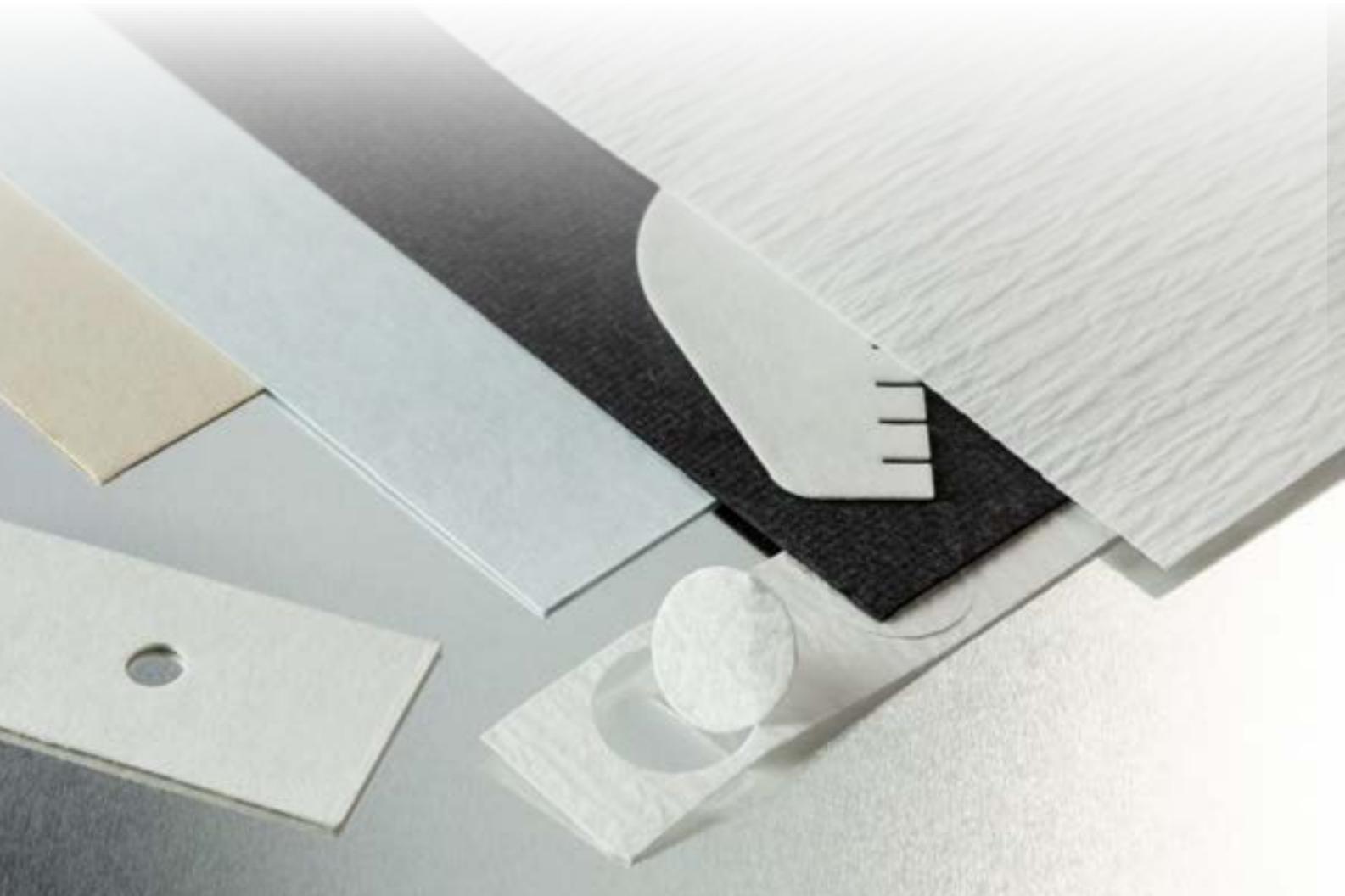
The types listed above are available as filter circles and folded filters in various sizes. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.



## 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 speciality 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, molecular biology, pharmaceuticals, food and beverage industry, chemical industry, recycling of oils and industrial liquids and electroplating, benefit from the consistent quality of our papers, which remains unchanged from batch to batch.



### Technical data

|        | Type   | 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 | 520bll | 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           |
|        | 0048   | Cellulose/synthetic, low density high break load   | 500 ***                 | n/a                           | 130           | 0.68           |
| Card   | 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           |
|        | 23     | slow, wet strength                                 | 750                     | 2 – 4                         | 240           | 0.45           |

\* Approximate value  
\*\* 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. 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 at the aims and objectives of the filtration process should be completed before a filtration medium is selected. The following questions will help you find the best filter paper:

- What is filtered?
  - What 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 metre 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 fibres                                                                                                                  | 0048         |                           |                                 |

### Ordering information

The types listed in the table are available in different varieties upon request: sheet material, rolls and special cuts.



## Low nitrogen filter paper

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

| Type | Filtration Herzberg [s] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|------|-------------------------|----------------------------|----------------|
| 2095 | 650                     | 85                         | 0.17           |

### Ordering information

Type 2095 is available folded filters with 240 mm. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.

## Kieselguhr filter paper

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

| Type | Filtration Herzberg [s] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|------|-------------------------|----------------------------|----------------|
| 287  | 660                     | 154                        | 0.36           |

### Ordering information

Type 287 is available as filter circles with the following sizes (in mm): 125 – 150 – 185 – 240. Order numbers from page 134. Other formats, filter circles, sheet material, rolls and special cuts are available on request.



### Activated carbon filter paper

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

| Type | Filtration Herzberg [s] | Weight [g/m²] | Thickness [mm] |
|------|-------------------------|---------------|----------------|
| 508  | 360                     | 196           | 0.52           |

**Ordering information**  
Type 508 is available as filter circles with 110 mm. Order numbers from page 134. Other sizes, sheet formats, rolls and special cuts are available on request.

### Black filter paper

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

| Type | Properties  | Filtration Herzberg [s] | Weight [g/m²] | Thickness [mm] |
|------|-------------|-------------------------|---------------|----------------|
| 551  | slow, black | 850                     | 95            | 0.20           |

**Ordering information**  
Type 551 is available as filter circles with the following sizes (in mm): 55 – 70 – 90 – 240. Order numbers from page 134. Other formats, folded filters, sheet material, rolls and special cuts are available on request.



For quantitative analysis in breweries, the types 589/1 and 589/2 are recommended



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 filtering
- Ideal for clarification and sample preparation
- Suitable for removing CO<sub>2</sub> and turbidities
- For quantitative analyses 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 analyses”

Applications

- 2555: Sample preparation for extract determination of malt
- 597: Removal of carbon dioxide and turbidity from cold trub; determination of coagulated proteins (nitrogen) and the grade of fermentation
- 595: Samples preparation and clarification
- 602h: Removal of carbon dioxide and turbidity from beer
- GF 20: Ideal for rapid clarification and degassing of carbonated drinks

Technical data

| Type  | Surface           | Filtration Herzberg [s] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|-------|-------------------|-------------------------|----------------------------|----------------|
| 2555  | grained           | 110                     | 75                         | 0.17           |
| 595   | smooth            | 140                     | 68                         | 0.18           |
| 597   | smooth            | 160                     | 85                         | 0.15           |
| 602h  | smooth            | 750                     | 84                         | 0.16           |
| GF 20 | org., hydrophilic | 110                     | 86                         | 0.50           |

The types 2555, 597, 595 and 602h are available as folded filters in various sizes. The type GF 20 is available as filter circles with 150 mm in diameter. Order numbers from page 134. Other sizes, folded filters, sheets and special cuts are available on request.

Filter papers for the 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

| Type | Properties     | Filtration Herzberg [s] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|------|----------------|-------------------------|----------------------------|----------------|
| 3459 | fast, creped   | 110                     | 74                         | 0.30           |
| 3002 | medium, smooth | 150                     | 61                         | 0.14           |

Ordering information

The types 3002 and 3459 are available as filter circles sized 200 or 230 mm. Order numbers from page 134. Other sizes, folded filters, sheets and special cuts are available on request.

## 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.
- The QC includes the testing for resins and fats according to ISO 624. In this way we ensure a minimum content of extractables.

Wall thickness:

1.3 mm in thimbles with  $\leq 35$  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

Ordering information

The cellulose thimbles of type 900 and 901 are available in various sizes. Order numbers from page 134. Other sizes, rolls and special cuts are available on request.



## Glass fibre extraction thimbles

Recommended for analysis of particles and aerosols in gases and air

- Made of 100% pure borosilicate microfibres, without binding elements
- Thickness is 1.5 mm (diameter < 33 mm)
- Good stability at high temperatures of up to 500°C in hot, humid or acidic gases
- Minimum level of extractables

## Applications

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

### Technical data

| Type | Retention rate* [%] | Max. temp. [°C] |
|------|---------------------|-----------------|
| CFV  | >99                 | 500             |

*\* Tested with NaCl particles size <1 µm, maximum of 0.3 to 0.5 µm*

### Ordering information

The glass fibre thimbles are available in various sizes. Order numbers from page 134. Other sizes, rolls and special cuts are available on request.



High loading capacity and high air permeability at a high retention rate for small particles of >99% as per BS 4400.

## 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 electrophoresis gels
- High wet strength for safe handling and lowest possible fiber release

## Applications

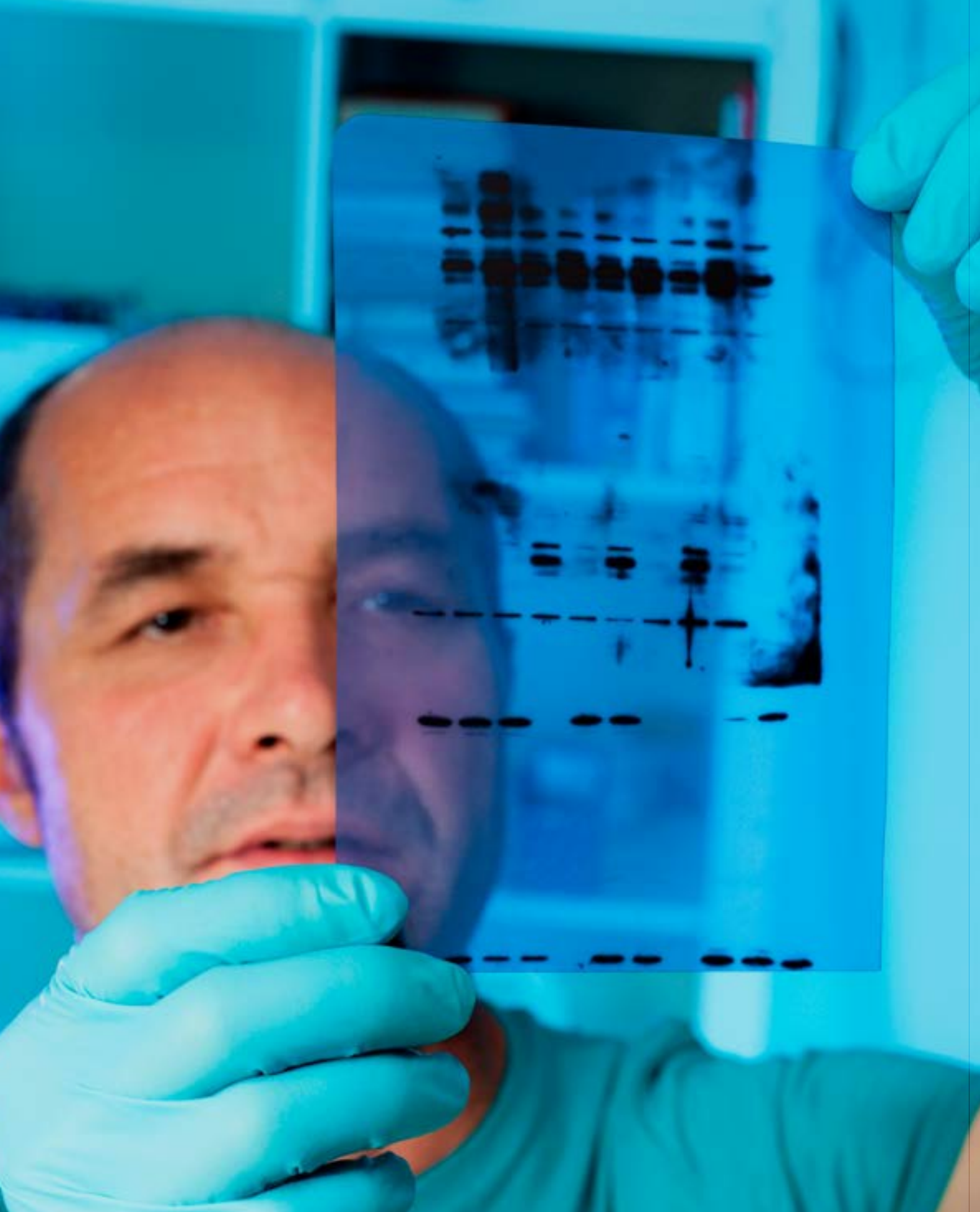
- Southern, northern and western blots; dot and slot blots
- Lifting of sequencing gels
- Lysis/denaturation of colony or plaque lifts

### Technical data

| Type  | Properties        | Surface | Thickness [mm] | Weight [g/m²] |
|-------|-------------------|---------|----------------|---------------|
| BP002 | medium absorbency | smooth  | 0.35           | 192           |
| BP003 | medium absorbency | smooth  | 0.90           | 320           |
| BP005 | high absorbency   | smooth  | 1.50           | 570           |

### Ordering information

Types BP002, BP003 and BP005 are available as sheets. Order numbers from page 134. Other formats and special cuts are available on request.



High, uniform capillary strength and uniform molecule transfer  
Ideal for reliable blotting in medical diagnostic laboratories



Meets the directive for carriers of active agents acc. to DIN 58940-2.

## Antibiotic test paper

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 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

| Type | Weight [g/m²] | Thickness [mm] | Absorption * [µl] |
|------|---------------|----------------|-------------------|
| 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).*

### Ordering information

The types 22, 2668 and 3324 are available as small, round discs. Order numbers from page 134. Other formats and special cuts are available on request.

## Absorbent protective paper 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

| Type  | Weight<br>[g/m²] | Thickness<br>[mm] | Water absorption<br>[g/m²] |
|-------|------------------|-------------------|----------------------------|
| 295PE | 120              | 0.20              | 110                        |

## Ordering information

The type 295PE is produced in sheets and rolls by default. Order numbers from page 134. Other formats and special cuts are available on request.



The high purity of the filter paper allows for the recovery and reuse of spilled liquids.

## Chromatography papers

Recommended for chromatographic analysis and preparations

- Made from pure linters with an  $\alpha$ -cellulose content of up to 98%
- High-performance resolution and wet strength
- The fibres run in predominantly one direction

Notes for handling

The absorption is always slightly greater along the linters fibres. The chromatography should be carried out along the direction of the fibres. This is indicated by the 570 or 600 mm 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.

## Applications

Analytical breakdown:

- For most chromatographic work: type 2043a, type 2043b
- For evaluation by elution out of the paper: 2043b

Preparative breakdown:

- Work with larger volumes of a substance: 2668

### Technical data

| Filter material                   | Type  | Properties  | Weight [g/m <sup>2</sup> ] | Thickness [mm] | Capillary rise * [mm] |
|-----------------------------------|-------|-------------|----------------------------|----------------|-----------------------|
| Analytical chromatography paper   | 2043a | medium-fast | 90                         | 0.17           | 105                   |
|                                   | 2043b | medium-fast | 125                        | 0.22           | 105                   |
| Preparatory Chromatography papers | 2668  | very fast   | 320                        | 0.90           | 155 **                |
| Chamber saturation paper          | 5703  | medium-fast | 240                        | 0.55           | –                     |

\* Measures in 30 min.

\*\* Measures in 10 min.

Ordering information

Types 2043a, 2043b, 2668 and 5703 are available as sheets: 460 x 570 mm and 580 x 600 mm. Order numbers from page 134 Other formats and special cuts are available on request.



Thicker papers allow higher sample volumes.  
Lower capillary rises offer higher resolutions.



#### 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.

## Germination test paper

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

- All papers are made of pure cellulose and are free from mould, bacteria and any toxic substances which might interfere with the growth of the 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 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

## Applications

- Types 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: Small seeds (flowers, grasses)

## Technical data

| Filter material | Type   | Properties                              | Weight [g/m²] | Thickness [mm] |
|-----------------|--------|-----------------------------------------|---------------|----------------|
| TP method       | 597    | for petri dishes, Jacobsen tank         | 81            | 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           |
| BP method       | 520b   | white                                   | 155           | 0.65           |
|                 | 5703   | white                                   | 239           | 0.55           |
| PP method       | 3014   | pleated strips, white                   | 110           | 0.22           |
|                 | 3236   | pleated strips, grey                    | 110           | 0.22           |
|                 | 0858   | wrapping strips for pleated strips      | 75            | 0.17           |

### Ordering information

Following standard formats are available:

Types 3014, 3236 as pleated strips 110 x 20 x 2000 mm with precisely 50 double folds

Type 0858 as wrapping strips 110 x 580 mm

Types 520b and 5703 as sheets 580 x 580 mm

Order numbers from page 134. Other formats and special cuts are available on request.



## Lens cleaning paper

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

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

## Applications

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

### Ordering information

The type 310 is available in a standard format of 10 x 15 cm. Order numbers from page 134. Other formats and special cuts are available on request.

## Weighing paper

The 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

| Type | Weight<br>[g/m <sup>2</sup> ] | Thickness<br>[mm] | Nitrogen content<br>[%] |
|------|-------------------------------|-------------------|-------------------------|
| 360  | 25                            | 0,02              | 0.04                    |

### Ordering information

Following standard formats are available: 5 x 5 cm, 10 x 10 cm and 15 x 15 cm  
Order numbers from page 134. Other formats and special cuts are available on request.



## Cytocentrifuge papers

Highly absorbent papers made of pure cellulose

- Absorb a large volume of liquid
- No disruptive substances or fibres are released into the liquid medium

## Applications

The papers are ideal for absorbing liquids during centrifuging of cell and tissue preparations.

### Technical data

| Type  | Size [mm] | Weight [g/m <sup>2</sup> ] | Thickness [mm] |
|-------|-----------|----------------------------|----------------|
| 2589C | 25 x 75   | 400                        | 0.75           |
| 2589D | 25 x 75   | 500                        | 1.00           |

### Ordering information

Filter papers 2589C and 2589D are supplied as cut pieces in a standard format of 25 mm × 75 mm, with two 6 mm holes. All grades are also available as custom cuts. Please don't hesitate to contact us for further details and advice.

Order numbers from page 138.

## Drying pad

Absorbent paper made of pure cellulose

- Absorbs a large volume of liquid
- No disruptive substances or fibres are released into the suspended sample

## Applications

The papers are ideal for removing excess liquid on microscope slides. As a result, they dry stained microscopy specimens quickly, cleanly and easily.

1 pad = 50 strips, measuring 37 x 100 mm

Order numbers from page 138.

## 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  $\mu\text{m}$  and 0.45  $\mu\text{m}$

### Technical data

| Pore size<br>[ $\mu\text{m}$ ] | Thickness*<br>[ $\mu\text{m}$ ] | Flow rate**<br>[ml/min] | Bubble pressure***<br>[bar] |
|--------------------------------|---------------------------------|-------------------------|-----------------------------|
| 0.2                            | 125                             | 21                      | 3.6                         |
| 0.45                           | 125                             | 39                      | 2.7                         |

\* as per DIN 53105

\*\* as per DIN 58355: Average value per  $\text{cm}^2$  area at  $\Delta p = 0,9 \text{ bar}$

\*\*\* as per DIN 58355

- Adsorption: bovine serum albumin  $< 10 \mu\text{g}/\text{cm}^2$
- Extractables with water less than 1%
- Sterilisation: by autoclaving at 121°C or 134 °C, with  $\gamma$ -radiation, dry heat or ethylene oxide
- Temperature-resistant up to 180 °C
- The resistance to various chemical solvents is summarised on page 134

## Applications

- Filtration of aqueous solutions for biological and clinical analyses
- Sterilisation of biological solutions (CA-membranes with a pore size of 0.2  $\mu\text{m}$  are specially recommended when the recovery of proteins is critical)
- Filtration of proteins and enzymes
- Biological and clinical analyses
- Sterilisation of culture media (0.2  $\mu\text{m}$ )

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.



## Cellulose nitrate membrane filters

Ideal for clarification and sterilisation of aqueous solutions, microbiological analyses 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 × 3.1 mm) or plain, sterile or non-sterile

### Technical data

| Pore size<br>[µm] | Thickness*<br>[µm] | Flow rate**<br>[ml/min] | Bubble pressure***<br>[bar] |
|-------------------|--------------------|-------------------------|-----------------------------|
| 0.2               | 100                | 12                      | 3.2                         |
| 0.45              | 100                | 36                      | 1.8                         |
| 0.8               | 100                | 87                      | 0.9                         |

\* as per DIN 53105

\*\* as per DIN 58355: Average value per cm<sup>2</sup> area at Δp = 0,7 bar

\*\*\* as per DIN 58355

- Adsorption: 160 µg/cm<sup>2</sup> 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 134

## 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 prior to further analyses
- Removal of particles in suspensions to determine the degree of impurity
- Measurement of sewage sludge in clarification plants (0.8 µm)
- Immunological analyses, which allow only a very low level of extractable substances 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

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.



### Sterility Test as per USP:

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

### Microbial test:

- Retention of 10<sup>7</sup> organisms/cm<sup>2</sup> Serratia marcescens ATCC 14756.
- Recovery of Fecal Coliform > 90%

## Mixed cellulose ester membrane filters

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

- Made of a blend of cellulose nitrate and cellulose acetate
- High flow rate and high non-specific adsorption
- High mechanical stability
- Suitable for aqueous solutions (pH 4-8), hydrocarbons and some diluted solvents

### Technical data

#### non-sterile membrane filters

| Pore size<br>[µm] | Thickness *<br>[µm] | Flow rate **<br>[ml/min] | Bubble pressure<br>***<br>[bar] |
|-------------------|---------------------|--------------------------|---------------------------------|
| 0.2               | 120                 | 15                       | 3.5                             |
| 0.45              | 120                 | 40                       | 2.0                             |
| 3                 | 170                 | 200                      | 0.5                             |
| 5                 | 170                 | 250                      | 0.4                             |
| 8                 | 180                 | 300                      | 0.2                             |

#### sterile membrane filters

| Pore size<br>[µm] | Thickness *<br>[µm] | Flow rate **<br>[ml/min] | Bubble pressure<br>***<br>[bar] |
|-------------------|---------------------|--------------------------|---------------------------------|
| 0.2               | 120                 | 15                       | 3.3                             |
| 0.45              | 120                 | 40                       | 1.8                             |

\* as per DIN 53105  
\*\* as per DIN 58355: Average value per cm<sup>2</sup> area at Δp = 0.9 bar  
\*\*\* as per DIN 58355

- Adsorption: 160 µg/cm<sup>2</sup> 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 134.

## Applications

- The membranes with a pore size of 0.45 µm are used for micro-organism counts (microbiological analyses)
- Membranes with grid lines are ideal for microbiological analyses (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 analyses (0.45 µm)
- Gravimetric 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
- Sterilised membranes (packaged in individual blisters) ensure that the filter is not contaminated.
- 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

**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<sup>7</sup> organisms/cm<sup>2</sup> *Serratia marcescens* ATCC 14756.
- Recovery of Fecal Coliform > 90%.

**Ordering information**

The article numbers of the membrane filters are available on page 142. Other versions are available on request.



Ideal for gravimetric measurements, constant weight  
Extractables with water less than 1% to ensure sample purity

## Nylon membrane filters

Recommended for filtration, sterilisation and clarifications 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

| Pore size [µm] | Thickness * [µm] | Flow rate ** [ml/min] | Bubble pressure *** [bar] |
|----------------|------------------|-----------------------|---------------------------|
| 0.2            | 100              | 6                     | 3.6                       |
| 0.45           | 100              | 20                    | 1.8                       |

\* as per DIN 53105

\*\* as per DIN 58355: Average value per cm<sup>2</sup> area at Δp = 0,9 bar

\*\*\* as per DIN 58355

- Adsorption: bovine serum albumin 100 µg/cm<sup>2</sup> (for 0.2 µm pore size)
- Extractables with water less than 1%
- Sterilisation: by autoclaving (at 121 °C) or ethylene oxide
- Temperature-resistant up to 134 °C
- The resistance to various chemical solvents is summarised on page 134

## Applications

- Particle removing filtration of water, and aqueous solutions and solvents for HPLC
- Isolating Legionella
- These filters are not recommended for applications such as the 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

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.



## PTFE membranes 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

| Pore size<br>[µm] | Thickness *<br>[µm] | Flow rate **<br>[ml/min] | Bubble pressure<br>***<br>[bar] |
|-------------------|---------------------|--------------------------|---------------------------------|
| 0.2               | 220                 | 12                       | 1.2                             |
| 0.45              | 220                 | 25                       | 0.6                             |
| 5                 | 220                 | 300                      | -                               |

\* as per DIN 53105

\*\* as per DIN 58355: Average value per cm<sup>2</sup> area at Δp = 0.7 bar

\*\*\* as per DIN 58355 Isopropanol 60%

- Adsorption 5 µg/cm<sup>2</sup> for γ-globulin (pore size 0.2 µm)
- Extractables with water not detected
- Sterilisation: by autoclaving (at 121 °C or 134 °C) or ethylene oxide
- Temperature-resistant up to 145 °C
- The resistance to various chemical solvents is summarised on page 134

### 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

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.

## Cellulose acetate syringe filter

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/cm<sup>2</sup>)
- Suitable for aqueous solutions (pH 4-8) and most alcohols, carbohydrates and oils
- High flow rates: 0,2 µm: 16,1 ml/min/cm<sup>2</sup>; 0,45 µm: 54,7 ml/min/cm<sup>2</sup> (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 136.

### Technical data

| Membrane diameter | Case material | Fitting inlet    | Fitting outlet | Filter area (cm <sup>2</sup> ) | Sample volume (ml) | Hold-up volume (µl) | Max. pressure (bar) | Max. Operating Temp. (°C) | Method of sterilisation |
|-------------------|---------------|------------------|----------------|--------------------------------|--------------------|---------------------|---------------------|---------------------------|-------------------------|
| 25 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 3                              | < 100              | < 100               | 6                   | 50                        | γ-radiation             |
| 30 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 4.5                            | < 200              | < 200               | 6                   | 50                        | γ-radiation             |

## 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)

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.

## 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 non-specific 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
- The resistance to various chemical solvents is summarised on page 136.
- Minimum of extractables

### Technical data

| Membrane diameter | Case material | Fitting inlet    | Fitting outlet | Filter area (cm <sup>2</sup> ) | Sample volume (ml) | Hold-up volume (µl) | Max. pressure (bar) | Max. Operating Temp. (°C) | Method of sterilisation |
|-------------------|---------------|------------------|----------------|--------------------------------|--------------------|---------------------|---------------------|---------------------------|-------------------------|
| 13 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 1                              | <10                | < 25                | 6                   | 50                        | γ-radiation             |
| 25 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 3                              | <100               | < 100               | 6                   | 50                        | γ-radiation             |
| 30 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 4.5                            | <200               | < 200               | 6                   | 50                        | γ-radiation             |

## 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)

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.

## 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 136.

### Technical data

| Membrane diameter | Case material | Fitting inlet    | Fitting outlet | Filter area (cm <sup>2</sup> ) | Sample volume (ml) | Hold-up volume (µl) | Max. pressure (bar) | Max. Operating Temp. (°C) | Method of sterilisation |
|-------------------|---------------|------------------|----------------|--------------------------------|--------------------|---------------------|---------------------|---------------------------|-------------------------|
| 13 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 1                              | <10                | < 25                | 6                   | 50                        | γ-radiation             |
| 25 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 3                              | <100               | < 100               | 6                   | 50                        | γ-radiation             |
| 30 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 4.5                            | <200               | < 200               | 6                   | 50                        | γ-radiation             |

## Applications

- Filtration and clarification of small volumes prior to injection into HPLC system (0.45 µm)
- Sterilisation of aqueous and dilute organic solvents (0.2 µm)
- HPLC: Filtration of aqueous and organic solvents (0.45 µm)

### Ordering information

The article numbers of the membrane filters are available on page 142. Other versions are available on request.





Owing to the colour code of Hahnemühle syringe filters, a mix-up can be excluded:

- i

  - Orange = cellulose acetate
  - Light blue = regenerated cellulose
  - Blue = nylon
  - Pink = PTFE

## PTFE syringe filter

Recommended for HPLC and GC samples, sterilisation and clarification of most solvents and filtration of gases and for sterile 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
- The resistance to various chemical solvents is summarised on page 136.
- Free from wetting agents
- They must be pre-wetted with a polar solvent such as ethanol or isopropanol before filtering aqueous samples

### Technical data

| Membrane diameter | Case material | Fitting inlet    | Fitting outlet | Filter area (cm²) | Sample volume (ml) | Hold-up volume (µl) | Max. pressure (bar) | Max. Operating Temp. (°C) | Method of sterilisation |
|-------------------|---------------|------------------|----------------|-------------------|--------------------|---------------------|---------------------|---------------------------|-------------------------|
| 13 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 1                 | <10                | < 25                | 6                   | 50                        | γ-radiation             |
| 25 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 3                 | <100               | < 100               | 6                   | 50                        | γ-radiation             |
| 30 mm             | Polypropylene | Female Luer-Lock | Male Luer-Slip | 4.5               | <200               | < 200               | 6                   | 50                        | γ-radiation             |

## Applications

- Sterilisation (0.2 µm) and clarification (0.45 µm) of most acids and aggressive solvents
- Degassing solvents (0.45 µm)
- Venting of sterile 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)

Ordering information  
The article numbers of the membrane filters are available on page 142. Other versions are available on request.

The optimal filter paper for every application

Residue analysis

| Quantitative analysis                                       |                                                                    |                                                              |                                                                        |                                                             |  |
|-------------------------------------------------------------|--------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------|-------------------------------------------------------------|--|
| Aqueous solutions very acidic/alkaline                      |                                                                    | Aqueous solutions acidic/alkaline                            |                                                                        | Air/gases                                                   |  |
| Pressure/vacuum high                                        | Pressure/vacuum normal                                             | Pressure/vacuum normal                                       |                                                                        | Pressure/vacuum normal                                      |  |
| Paper hardened quantitative                                 | Glass microfibre                                                   | Paper quantitative                                           | Glass microfibre                                                       | Glass/quartz-microfibre                                     |  |
| Coarse precipitates (12–25 µm)*, fast:<br><b>1505</b>       | Colloidal precipitates (1–3 µm)*:<br><b>GF 50-51-52-55, GF 6-9</b> | Coarse precipitates (12–25 µm)*, fast:<br><b>589/1</b>       | Colloidal precipitates (1–3 µm)*:<br><b>GF 50-51-52-55, GF 6-9, 20</b> | Colloidal precipitates (1–3 µm)*:<br><b>QFH/CFV GF 6-10</b> |  |
| Medium-fine precipitates (4–12 µm)*, medium:<br><b>1506</b> | Colloidal precipitates (1–3 µm), extreme pH*:<br><b>QFH</b>        | Medium-fine precipitates (4–12 µm)*, medium:<br><b>589/2</b> |                                                                        |                                                             |  |
| Very fine precipitates (≤ 2 µm)*, slow:<br><b>1507</b>      |                                                                    | Medium-fine precipitates (4–7 µm)*, medium:<br><b>589/4</b>  |                                                                        |                                                             |  |
|                                                             |                                                                    | Fine precipitates (4 µm)*, medium:<br><b>589/5</b>           |                                                                        |                                                             |  |
|                                                             |                                                                    | Very fine precipitates (2 µm)*, slow:<br><b>589/6</b>        |                                                                        |                                                             |  |
|                                                             |                                                                    | Colloidal precipitates (1–2 µm)*, very slow:<br><b>589/3</b> |                                                                        |                                                             |  |
|                                                             |                                                                    | Precipitates with nitrates, slow:<br><b>2095</b>             |                                                                        |                                                             |  |

Please use quartz and glass microfibre filter at high pressure with mechanical support only.

\*Retention range are approximate values.

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

Please use quartz and glass microfibre filter at high pressure with mechanical support only.

\*Retention range are approximate values.

The optimal filter paper for every application

Filtrate analysis

| Removal of particles (sample preparation)          |                                                       |                                                       |                                                     |                                                                    |
|----------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------------|
| Aqueous solutions, very acidic/alkaline            |                                                       | Aqueous solutions acidic/alkaline                     |                                                     |                                                                    |
| Pressure/vacuum high                               | Pressure/vacuum normal                                | Pressure/vacuum normal                                |                                                     |                                                                    |
| Paper hardened qualitative                         | Glass microfibre                                      | Paper qualitative                                     | Glass microfibre                                    | Paper general                                                      |
| Coarse precipitates (12–25 µm)*, fast: 1573        | Colloidal precipitates (1–3 µm)*, medium: GF 51, GF 9 | Coarse precipitates (12–25 µm)*, fast: 604            | Colloidal precipitates (1–3 µm)*: GF 51, GF 9 GF 20 | Coarse precipitates (12–25 µm)*, fast: 1450nf, 0905                |
| Medium-fine precipitates (7–12 µm)*, medium: 1574  | Colloidal precipitates (1–3 µm)*: QFH                 | Medium-fine precipitates (7–12 µm)*, medium: 591, 598 |                                                     | Medium-fine precipitates (7–12 µm)*, medium: 0860, 0859, 400, 0858 |
| Very fine precipitates (≤ 2 µm)*, slow: 1575, 1577 |                                                       | Medium-fine precipitates (4–7 µm)*, medium: 597, 595  |                                                     | Fine precipitates (4–7 µm)*, medium: 0903                          |
|                                                    |                                                       | Fine precipitates (2–5 µm)*, medium: 593              |                                                     |                                                                    |
|                                                    |                                                       | Very fine precipitates (2 µm)*, slow: 602h            |                                                     |                                                                    |
|                                                    |                                                       | Colloidal precipitates (<2 µm)*, very slow: 602eh     |                                                     |                                                                    |

Please use quartz and glass microfibre filter at high pressure with mechanical support only.

\*Retention range are approximate values.

Overview of filtration speeds

|        | Technical grade | Analytical grade |              | Quality of the precipitate |       |
|--------|-----------------|------------------|--------------|----------------------------|-------|
|        |                 | qualitative      | quantitative |                            |       |
| slow   | 287             | 602eh            |              | colloidal                  | 1 µm  |
|        |                 | 1577             | 589/3        |                            |       |
|        | 23              | 602h, 1575       | 1507         | very fine crystalline      |       |
| medium |                 |                  | 589/6        |                            |       |
|        | 2589d           |                  |              |                            |       |
|        | 0903, 2589c     | 593              | 589/5        |                            |       |
|        | BF, 22          |                  |              |                            |       |
|        | 2589b           |                  |              | fine crystalline           |       |
|        | 572             | 595, 1574        | 589/4, 1506  |                            |       |
|        | 3605, 3205      | 597              | 589/2        |                            |       |
|        | 0860            |                  |              |                            |       |
|        | 2529a, 2048     |                  |              | medium-fine crystalline    |       |
|        | 0858, 0859      | 591, 598         |              |                            |       |
| fast   | 2208, 2294      |                  |              |                            |       |
|        | 2410            |                  |              |                            |       |
|        | 1450nf, 2282    | 604              | 589/1        | coarse crystalline, flaky  |       |
|        | 2772, 0905      | 1573             | 1505         |                            |       |
|        | 520a            |                  |              |                            |       |
|        | 3144L           |                  |              | gelatinous                 |       |
|        | 520b, 520bII    |                  |              |                            | 25 µm |

The relative position of the individual grades on the µm axis is to be understood as approximate rather than absolute.

## 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
- 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:

Please see the overview of chemical compatibilities of the several membranes and syringe filters on pages 134-137. 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 fibre filter as a pre-filter. The glass fibre 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: +49 55 61 791 687, Fax: +49 55 61 791 377, [filtration@hahnemuehle.com](mailto:filtration@hahnemuehle.com)*

## The optimal filter type for every application

| Sample                            | Type of membrane |                       | Benefits of the membrane type                           |
|-----------------------------------|------------------|-----------------------|---------------------------------------------------------|
| Aqueous solution (hydrophile)     | 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 gravimetric 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 (hydrophilic) |
| Organic solution (hydrophobic)         | PTFE             | Polytetrafluorethylene | Used for very strong acids and bases                      |
| Gases, even strongly oxidising         | PTFE             | Polytetrafluorethylene | Used for very strong acids and bases                      |

## Quality management

Hahnemühle strives to offer products and services that consistently meet our customers' requirements and expectations by applying a strict quality management system.

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

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

Product manufacturers and quality assurance institutions must measure a product's performance and quality in a wide range of applications to verify its suitability. ISO/EN standards, guidelines issued by shareholder associations and state agencies stipulate the processes and tools for each application, not to mention the thresholds that must be observed. Filter papers from Hahnemühle provide a high degree of security.

Hahnemühle syringe filters and membranes are subject to stringent quality checks both during and after production. Finished products' storage life in the warehouse is constantly monitored. Each filter holder also undergoes the following five tests: bubble point, burst pressure, membrane adsorption, flow rate and extractable substances.

Hahnemühle has been a 'Brand of the Century' since 2016 and is part of the exclusive circle of Germany's strongest brands.



## Sustainability

Clean water, natural fibres, first-rate expertise in paper production and absolute quality awareness have formed the foundation of our success for over 435 years. Using precious resources such as water, fibres and energy carefully and responsibly is a matter of course for us.

The water we use to produce our valuable FineArt papers comes straight from the source and is set apart by its particularly high level of purity, meaning it requires no chemical treatment whatsoever. Even at the end of the production cycle, the wastewater has not been contaminated with pollutants and is returned to the river as high-quality water.



FSC/PEFC-  
certified  
fibres



Linters – a by-product  
of the textile and oil  
industries



Reuse of production  
waste and use of  
recycled packaging  
materials



Electricity from  
100% renewable  
energy sources

## 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 fibre filters)  
Sodium chloride aerosols with a particle size < 1µm (maximum for 0.3 – 0.5µm) are applied to a paper. Any aerosol passing through the paper is defined as photometric. Inflow velocity: 3 m/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 /m<sup>2</sup>)  
Test used to determine the amount of water absorbed after 10 minutes by the surface of a 100 cm<sup>2</sup> large test sample under pre-assigned conditions. EN ISO 535.
- **Thickness** (mm)  
Thickness is determined using a meter (test area = 2 cm<sup>2</sup>). As per EN ISO 534, the surface pressure averages 25 kPa.
- **Iron** (mg /100 g)  
DIN 54374.
- **Grammage** (g /m<sup>2</sup>)  
A 100 cm<sup>2</sup> 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 cm<sup>2</sup> sample area. ASTM-D726.
- **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 10 cm<sup>2</sup>) at a constant hydrostatic head.
- **Copper** (mg /100 g)  
DIN 54375.
- **Porosity** (L/m<sup>2</sup> s)  
Determination of apparent porosity with a pressure differential of 2 mbar and a test area of 20 cm<sup>2</sup>. EN ISO 9237
- **Wet tensile** (mm, water column)  
Determined by continuously increasing a water column over a test area of 14.5 cm<sup>2</sup> 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 /m<sup>2</sup>)  
Determination by differential weighing of a sample with a surface area of 100 cm<sup>2</sup>. (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 for membranes

| 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<br>DIN 58355 part 2<br>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 as per<br>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/cm <sup>2</sup> |
| 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 <sup>2</sup> .                                                                                                                                                                 | ml/min/cm <sup>2</sup> |
| Thickness                                      | The determination is carried out using callipers with 2 cm <sup>2</sup> jaws and a contact pressure of 0.1 bar (100 g/cm <sup>2</sup> ).                                                                                                                                                                           | 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                      |

| Test Criteria                                                                        | Description                                                                                                                                                                                                                                                                                                                                                                               | Units                                |
|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| Burst pressure<br>DIN 53 141 part 1                                                  | A 10 cm <sup>2</sup> 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<br>(Weight loss)<br>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<br>DIN 58 355 part 3<br>ASTM D 3863 C                       | A medium containing test bacteria is filtered through the membrane filter (micro-organism density 10 <sup>7</sup> microorganisms/cm <sup>3</sup> ). After an incubation period of 72 hours the filtrate must show no signs of bacterial growth.<br>Test bacteria: 0.15 µm - <i>Burkholderia cepacia</i><br>0.2 µm - <i>Brevundimonas diminuta</i><br>0.45 µm - <i>Serratia marcescens</i> | Optical<br>evaluation<br>(Turbidity) |
| Checking the sterilisation method<br>with bio-indicators as per<br>DIN 58 948 Teil 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.<br>Test spores:<br>Ethylene oxide gas exposure: <i>Bacillus subtilis</i><br>γ-sterilisation: <i>Bacillus pumilus</i>                      | Optical<br>evaluation<br>(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           | –  | ++  | ++  | ++  | ++   |

| 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%    | –  | –  | –   | –  | ++   |
| Sulphuric acid, 25%       | –  | –  | +   | –  | ++   |
| Sulphuric 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 compatibility | +  | not analysed   | 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.

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                 | ++ | +  | ++ | ++ | ++   |
| Dimethylformamide             | +  | –  | +  | +  | ++   |
| Dimethylsulfoxide             | ++ | –  | ++ | ++ | ++   |
| Dioxane                       | ++ | –  | ++ | ++ | ++   |
| Ethanol, 98%                  | +  | +  | +  | ++ | ++   |
| Ethylene glycol               | ++ | ++ | ++ | ++ | ++   |
| Glycerine                     | +  | +  | +  | ++ | ++   |
| 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                        | +  | ++ | +  | ++ | ++   |
| ACIDS                         |    |    |    |    |      |
| Formic acid                   | +  | +  | –  | –  | ++   |
| Acetic acid, 25%              | +  | –  | +  | ++ | ++   |

| Membrane                  |    | AC | CR | NY | PTFE |
|---------------------------|----|----|----|----|------|
| Housing                   | PP |    |    |    |      |
| Acetic acid, 80%          | +  | –  | +  | +  | ++   |
| Phosphoric acid, 25%      | +  | –  | –  | –  | ++   |
| Nitric acid, 25 %         | +  | –  | –  | –  | ++   |
| Hydrochloric acid, 25 %   | +  | –  | –  | –  | ++   |
| Sulphuric acid, 25%       | ++ | –  | +  | –  | ++   |
| Sulphuric 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 analysed   | 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.

Order numbers:

Filter papers

| Type  | Format                   | Pack size | Order number |
|-------|--------------------------|-----------|--------------|
| 0048  | Filter circles, 32 mm    | 1000 pc.  | DP0048032    |
| 0858  | Sheets 110 x 580 mm      | 500 pc.   | 08581158     |
| 0858  | Sheets 300 x 300 mm      | 100 pc.   | 52858812     |
| 0858  | Sheets 580 x 580 mm      | 500 pc.   | RM08585858   |
| 0858  | Folded filters, 150 mm   | 100 pc.   | DF0858150    |
| 0858  | Folded filters, 185 mm   | 100 pc.   | DF0858185    |
| 0858  | Folded filters, 240 mm   | 100 pc.   | DF0858240    |
| 0858  | Folded filters, 320 mm   | 100 pc.   | DF0858320    |
| 0859  | Sheets, 580 mm x 580 mm  | 500 pc.   | RM08595858   |
| 0860  | Sheets , 450 mm x 450 mm | 500 pc.   | RM08604545   |
| 0860  | Folded filters, 150 mm   | 100 pc.   | DF0860150    |
| 0860  | Folded filters, 185 mm   | 100 pc.   | DF0860185    |
| 0860  | Faltenfilter, 240 mm     | 100 pc.   | DF0860240    |
| 0860  | Folded filters, 320 mm   | 100 pc.   | DF0860320    |
| 0860  | Folded filters, 600 mm   | 50 pc.    | DF0860600    |
| 0903  | Sheets , 580 mm x 580 mm | 500 pc.   | RM09035858   |
| 0905  | Sheets , 580 mm x 580 mm | 500 pc.   | RM09055858   |
| 0905  | Folded filters, 320 mm   | 100 pc.   | DF0905320    |
| 1505  | Filter circles, 110 mm   | 100 pc.   | DP1505110    |
| 1505  | Filter circles, 125 mm   | 100 pc.   | DP1505125    |
| 1505  | Filter circles, 150 mm   | 100 pc.   | DP1505150    |
| 1506  | Filter circles, 125 mm   | 100 pc.   | DP1506125    |
| 1506  | Filter circles, 150 mm   | 100 pc.   | DP1506150    |
| 1506  | Filter circles, 240 mm   | 100 pc.   | DP1506240    |
| 1507  | Filter circles, 125 mm   | 100 pc.   | DP1507125    |
| 1507  | Filter circles, 150 mm   | 100 pc.   | DP1507150    |
| 1507  | Filter circles, 185 mm   | 100 pc.   | DP1507185    |
| 1573  | Folded filters, 125 mm   | 100 pc.   | DF1573125    |
| 1573  | Folded filters, 185 mm   | 100 pc.   | DF1573185    |
| 1573  | Folded filters, 240 mm   | 100 pc.   | DF1573240    |
| 1573  | Filter circles, 90 mm    | 100 pc.   | DP1573090    |
| 1573  | Filter circles, 125 mm   | 100 pc.   | DP1573125    |
| 1573  | Filter circles, 150 mm   | 100 pc.   | DP1573150    |
| 1573  | Filter circles, 185 mm   | 100 pc.   | DP1573185    |
| 1573  | Filter circles, 240 mm   | 100 pc.   | DP1573240    |
| 1574  | Sheets 460 x 570 mm      | 100 pc.   | 15744657     |
| 1574  | Filter circles, 47 mm    | 100 pc.   | DP1574047    |
| 1574  | Filter circles, 70 mm    | 100 pc.   | DP1574070    |
| 1574  | Filter circles, 90 mm    | 100 pc.   | DP1574090    |
| 1574  | Filter circles, 110 mm   | 100 pc.   | DP1574110    |
| 1574  | Filter circles, 150 mm   | 100 pc.   | DP1574150    |
| 1574  | Filter circles, 240 mm   | 100 pc.   | DP1574240    |
| 1575  | Filter circles, 55 mm    | 100 pc.   | DP1575055    |
| 1575  | Filter circles, 70 mm    | 100 pc.   | DP1575070    |
| 1575  | Filter circles, 110 mm   | 100 pc.   | DP1575110    |
| 1575  | Filter circles, 125 mm   | 100 pc.   | DP1575125    |
| 1575  | Filter circles, 150 mm   | 100 pc.   | DP1575150    |
| 1575  | Filter circles, 240 mm   | 100 pc.   | DP1575240    |
| 2043A | Sheets 460 x 570 mm      | 100 pc.   | 2043A4657    |
| 2043A | Sheets 580 x 600 mm      | 100 pc.   | 2043A5860    |

| Type  | Format                                      | Pack size   | Order number  |
|-------|---------------------------------------------|-------------|---------------|
| 2043B | Sheets 460 x 570 mm                         | 100 pc.     | 2043B4657     |
| 2095  | Folded filters, 240 mm                      | 100 pc.     | DF2095240     |
| 22    | Round plates, 6 mm                          | 1000 pc.    | A22060        |
| 22    | Round plates, 9 mm                          | 1000 pc.    | A22090        |
| 2282  | Round plates 25 mm                          | 100 pc.     | DP2282025     |
| 2294  | Filter circles, 110 mm                      | 100 pc.     | DP2294110     |
| 2555  | Folded filters, 185 mm                      | 100 pc.     | DF2555185     |
| 2555  | Folded filters, 240 mm                      | 100 pc.     | DF2555240     |
| 2555  | Folded filters, 320 mm                      | 100 pc.     | DF2555320     |
| 2589C | 25 x 75 mm, two holes (6 mm)                | 200 pc.     | 2589C2575     |
| 2589D | 25 x 75 mm, two holes (6 mm)                | 200 pc.     | 2589D2575     |
| 2668  | Round plates, 6 mm                          | 1000 pc.    | A2668060      |
| 2668  | Round plates, 9 mm                          | 1000 pc.    | A2668090      |
| 2668  | Sheets 580 x 600 mm                         | 50 pc.      | 26685860      |
| 2727  | Sheets 190 x 190 mm                         | 100 pc.     | 52270800      |
| 2772  | Folded filters, 500 mm                      | 100 pc.     | DF2772500     |
| 287   | Folded filters, 125 mm                      | 100 pc.     | DF287125      |
| 287   | Folded filters, 150 mm                      | 100 pc.     | DF287150      |
| 287   | Folded filters, 185 mm                      | 100 pc.     | DF287185      |
| 287   | Folded filters, 240 mm                      | 100 pc.     | DF287240      |
| 295PE | Roll 460 mm x 50 m                          | 1 pc.       | 55335865      |
| 295PE | Roll 1200mm x 50 m                          | 1 pc.       | 55335874      |
| 295PE | Sheets 460 x 570 mm                         | 100 pc.     | 55335885      |
| 2992  | Sheets 580x580mm                            | 100 pc.     | 52292358      |
| 3002  | Filter circles, 200 mm                      | 1000 pc.    | DP3002200     |
| 3014  | 110 mm x 2 m, 50 double folds, 20 mm height | 1008 pc.    | 301411200     |
| 3014  | 110 mm x 2 m, 50 double folds, 20 mm height | 306 pc.     | 301411200V300 |
| 310   | 10 x 15 cm                                  | 6 x 100 pc. | 3101015       |
| 3236  | 110 mm x 2 m, 50 double folds, 20 mm height | 1008 pc.    | 323611200     |
| 3324  | Round plates, Ø 6 mm                        | 1000 pc.    | A3324060      |
| 3459  | Filter circles, 230 mm                      | 100 pc.     | DP3459230     |
| 360   | 5 x 5 cm                                    | 500 pc.     | 3600505       |
| 360   | 10 x 10 cm                                  | 500 pc.     | 3601010       |
| 360   | 15 x 15 cm                                  | 500 pc.     | 3601515       |
| 400   | Filter circles, 47 mm                       | 100 pc.     | DP400047      |
| 400   | Filter circles, 55 mm                       | 100 pc.     | DP400055      |
| 400   | Filter circles, 70 mm                       | 100 pc.     | DP400070      |
| 400   | Filter circles, 90 mm                       | 100 pc.     | DP400090      |
| 400   | Filter circles, 110 mm                      | 100 pc.     | DP400110      |
| 400   | Filter circles, 125 mm                      | 100 pc.     | DP400125      |
| 400   | Filter circles, 130 mm                      | 100 pc.     | DP400130      |
| 400   | Filter circles, 150 mm                      | 100 pc.     | DP400150      |
| 400   | Filter circles, 185 mm                      | 100 pc.     | DP400185      |
| 400   | Filter circles, 200 mm                      | 100 pc.     | DP400200      |
| 400   | Filter circles, 240 mm                      | 100 pc.     | DP400240      |
| 400   | Filter circles, 250 mm                      | 100 pc.     | DP400250      |
| 400   | Filter circles, 500 mm                      | 100 pc.     | DP400500      |
| 400   | Sheets 460 x 570 mm                         | 100 pc.     | 4004657       |
| 400   | Folded filters, 70 mm                       | 100 pc.     | DF400070      |
| 400   | Folded filters, 90 mm                       | 100 pc.     | DF400090      |

| Type  | Format                  | Pack size | Order number |
|-------|-------------------------|-----------|--------------|
| 400   | Folded filters, 100 mm  | 100 pc.   | DF400100     |
| 400   | Folded filters, 110 mm  | 100 pc.   | DF400110     |
| 400   | Folded filters, 125 mm  | 100 pc.   | DF400125     |
| 400   | Folded filters, 130 mm  | 100 pc.   | DF400130     |
| 400   | Folded filters, 150 mm  | 100 pc.   | DF400150     |
| 400   | Folded filters, 185 mm  | 100 pc.   | DF400185     |
| 400   | Folded filters, 200 mm  | 100 pc.   | DF400200     |
| 400   | Folded filters, 300 mm  | 100 pc.   | DF400300     |
| 400   | Folded filters, 320 mm  | 100 pc.   | DF400320     |
| 400   | Folded filters, 400 mm  | 100 pc.   | DF400400     |
| 400   | Folded filters, 500 mm  | 100 pc.   | DF400500     |
| 400   | Folded filters, 650 mm  | 100 pc.   | DF400650     |
| 508   | Filter circles, 110 mm  | 100 pc.   | DP508110     |
| 520a  | Folded filters, 185 mm  | 100 pc.   | DF520a185    |
| 520a  | Folded filters, 240 mm  | 100 pc.   | DF520a240    |
| 520a  | Folded filters, 500 mm  | 100 pc.   | DF520a500    |
| 520b  | Sheets 580 x 580 mm     | 100 pc.   | 520b5858     |
| 520b  | Folded filters, 150 mm  | 100 pc.   | DF520b150    |
| 520b  | Folded filters, 185 mm  | 100 pc.   | DF520b185    |
| 520b  | Folded filters, 240 mm  | 100 pc.   | DF520b240    |
| 520b  | Folded filters, 500 mm  | 20 pc.    | DF520b500    |
| 520b  | Folded filters, 600 mm  | 20 pc.    | DF520b600    |
| 551   | Filter circles, 55mm    | 100 pc.   | DP551055     |
| 551   | Filter circles, 70mm    | 100 pc.   | DP551070     |
| 551   | Filter circles, 90mm    | 100 pc.   | DP551090     |
| 551   | Filter circles, 240mm   | 100 pc.   | DP551240     |
| 5703  | Sheets 580 x 580 mm     | 100 pc.   | 57035858     |
| 589/1 | Filter circles, 41 mm   | 100 pc.   | DP5891041    |
| 589/1 | Filter circles, 47 mm   | 100 pc.   | DP5891047    |
| 589/1 | Filter circles, 55 mm   | 100 pc.   | DP5891055    |
| 589/1 | Filter circles, 70 mm   | 100 pc.   | DP5891070    |
| 589/1 | Filter circles, 90 mm   | 100 pc.   | DP5891090    |
| 589/1 | Filter circles, 110 mm  | 100 pc.   | DP5891110    |
| 589/1 | Filter circles, 125 mm  | 100 pc.   | DP5891125    |
| 589/1 | Filter circles, 150 mm  | 100 pc.   | DP5891150    |
| 589/1 | Filter circles, 185 mm  | 100 pc.   | DP5891185    |
| 589/1 | Filter circles, 240 mm  | 100 pc.   | DP5891240    |
| 589/2 | Filter circles, 12.5 mm | 1000 pc.  | DP58920125   |
| 589/2 | Filter circles, 12.7 mm | 1000 pc.  | DP58920127   |
| 589/2 | Filter circles, 40.5 mm | 100 pc.   | DP58920405   |
| 589/2 | Filter circles, 55 mm   | 100 pc.   | DP5892055    |
| 589/2 | Filter circles, 70 mm   | 100 pc.   | DP5892070    |
| 589/2 | Filter circles, 90 mm   | 100 pc.   | DP5892090    |
| 589/2 | Filter circles, 110 mm  | 100 pc.   | DP5892110    |
| 589/2 | Filter circles, 125 mm  | 100 pc.   | DP5892125    |
| 589/2 | Filter circles, 150 mm  | 100 pc.   | DP5892150    |
| 589/2 | Filter circles, 185 mm  | 100 pc.   | DP5892185    |
| 589/3 | Filter circles, 47 mm   | 100 pc.   | DP5893047    |
| 589/3 | Filter circles, 55 mm   | 100 pc.   | DP5893055    |
| 589/3 | Filter circles, 70 mm   | 100 pc.   | DP5893070    |

| Type  | Format                 | Pack size | Order number |
|-------|------------------------|-----------|--------------|
| 589/3 | Filter circles, 90 mm  | 100 pc.   | DP5893090    |
| 589/3 | Filter circles, 110 mm | 100 pc.   | DP5893110    |
| 589/3 | Filter circles, 125 mm | 100 pc.   | DP5893125    |
| 589/3 | Filter circles, 150 mm | 100 pc.   | DP5893150    |
| 589/3 | Filter circles, 185 mm | 100 pc.   | DP5893185    |
| 589/3 | Filter circles, 240 mm | 100 pc.   | DP5893240    |
| 589/4 | Filter circles, 90 mm  | 100 pc.   | DP5894090    |
| 589/4 | Filter circles, 110 mm | 100 pc.   | DP5894110    |
| 589/4 | Filter circles, 125 mm | 100 pc.   | DP5894125    |
| 589/4 | Filter circles, 150 mm | 100 pc.   | DP5894150    |
| 589/5 | Filter circles, 55 mm  | 100 pc.   | DP5895055    |
| 589/5 | Filter circles, 90 mm  | 100 pc.   | DP5895090    |
| 589/5 | Filter circles, 110 mm | 100 pc.   | DP5895110    |
| 589/5 | Filter circles, 125 mm | 100 pc.   | DP5895125    |
| 589/5 | Filter circles, 150 mm | 100 pc.   | DP5895150    |
| 591   | Sheets 580x580mm       | 100 pc.   | 5915858      |
| 593   | Folded filters, 110 mm | 100 pc.   | DF593110     |
| 593   | Folded filters, 125 mm | 100 pc.   | DF593125     |
| 593   | Folded filters, 150 mm | 100 pc.   | DF593150     |
| 593   | Folded filters, 185 mm | 100 pc.   | DF593185     |
| 593   | Folded filters, 240 mm | 100 pc.   | DF593240     |
| 593   | Filter circles, 90 mm  | 100 pc.   | DP593090     |
| 593   | Filter circles, 125 mm | 100 pc.   | DP593125     |
| 593   | Filter circles, 150 mm | 100 pc.   | DP593150     |
| 593   | Filter circles, 185 mm | 100 pc.   | DP593185     |
| 593   | Filter circles, 320 mm | 100 pc.   | DP593320     |
| 595   | Sheets 580 x 580 mm    | 100 pc.   | 5955858      |
| 595   | Folded filters, 90 mm  | 100 pc.   | DF595090     |
| 595   | Folded filters, 110 mm | 100 pc.   | DF595110     |
| 595   | Folded filters, 125 mm | 100 pc.   | DF595125     |
| 595   | Folded filters, 150 mm | 100 pc.   | DF595150     |
| 595   | Folded filters, 185 mm | 100 pc.   | DF595185     |
| 595   | Folded filters, 240 mm | 100 pc.   | DF595240     |
| 595   | Folded filters, 270 mm | 100 pc.   | DF595270     |
| 595   | Folded filters, 320 mm | 100 pc.   | DF595320     |
| 595   | Folded filters, 385 mm | 100 pc.   | DF595385     |
| 595   | Folded filters, 500 mm | 100 pc.   | DF595500     |
| 595   | Filter circles, 47 mm  | 100 pc.   | DP595047     |
| 595   | Filter circles, 55 mm  | 100 pc.   | DP595055     |
| 595   | Filter circles, 70 mm  | 100 pc.   | DP595070     |
| 595   | Filter circles, 90 mm  | 100 pc.   | DP595090     |
| 595   | Filter circles, 110 mm | 100 pc.   | DP595110     |
| 595   | Filter circles, 125 mm | 100 pc.   | DP595125     |
| 595   | Filter circles, 150 mm | 100 pc.   | DP595150     |
| 595   | Filter circles, 185 mm | 100 pc.   | DP595185     |
| 595   | Filter circles, 240 mm | 100 pc.   | DP595240     |
| 597   | Sheets 580 x 580 mm    | 100 pc.   | 5975858      |
| 597   | Folded filters, 90 mm  | 100 pc.   | DF597090     |
| 597   | Folded filters, 110 mm | 100 pc.   | DF597110     |
| 597   | Folded filters, 125 mm | 100 pc.   | DF597125     |

Order numbers:

Filter papers

| Type  | Format                 | Pack size | Order number |
|-------|------------------------|-----------|--------------|
| 597   | Folded filters, 150 mm | 100 pc.   | DF597150     |
| 597   | Folded filters, 185 mm | 100 pc.   | DF597185     |
| 597   | Folded filters, 240 mm | 100 pc.   | DF597240     |
| 597   | Folded filters, 270 mm | 100 pc.   | DF597270     |
| 597   | Folded filters, 320 mm | 100 pc.   | DF597320     |
| 597   | Folded filters, 385 mm | 100 pc.   | DF597385     |
| 597   | Filter circles, 47 mm  | 100 pc.   | DP597047     |
| 597   | Filter circles, 55 mm  | 100 pc.   | DP597055     |
| 597   | Filter circles, 70 mm  | 100 pc.   | DP597070     |
| 597   | Filter circles, 90 mm  | 100 pc.   | DP597090     |
| 597   | Filter circles, 110 mm | 100 pc.   | DP597110     |
| 597   | Filter circles, 125 mm | 100 pc.   | DP597125     |
| 597   | Filter circles, 150 mm | 100 pc.   | DP597150     |
| 597   | Filter circles, 185 mm | 100 pc.   | DP597185     |
| 597   | Filter circles, 240 mm | 100 pc.   | DP597240     |
| 597   | Filter circles, 320 mm | 100 pc.   | DP597320     |
| 598   | Sheets 460 x 570 mm    | 100 pc.   | 5984657      |
| 598   | Folded filters, 90 mm  | 100 pc.   | DF598090     |
| 598   | Folded filters, 110 mm | 100 pc.   | DF598110     |
| 598   | Folded filters, 125 mm | 100 pc.   | DF598125     |
| 598   | Folded filters, 150 mm | 100 pc.   | DF598150     |
| 598   | Folded filters, 185 mm | 100 pc.   | DF598185     |
| 598   | Folded filters, 240 mm | 100 pc.   | DF598240     |
| 598   | Filter circles, 90 mm  | 100 pc.   | DP598090     |
| 598   | Filter circles, 110 mm | 100 pc.   | DP598110     |
| 602eh | Folded filters, 110 mm | 100 pc.   | DF602eh110   |
| 602eh | Folded filters, 125 mm | 100 pc.   | DF602eh125   |
| 602eh | Folded filters, 150 mm | 100 pc.   | DF602eh150   |
| 602eh | Folded filters, 185 mm | 100 pc.   | DF602eh185   |
| 602eh | Folded filters, 320 mm | 100 pc.   | DF602eh320   |
| 602eh | Filter circles, 125 mm | 100 pc.   | DP602eh125   |
| 602eh | Filter circles, 240 mm | 100 pc.   | DP602eh240   |
| 602h  | Folded filters, 90 mm  | 100 pc.   | DF602090     |
| 602h  | Folded filters, 110 mm | 100 pc.   | DF602110     |
| 602h  | Folded filters, 125 mm | 100 pc.   | DF602125     |
| 602h  | Folded filters, 150 mm | 100 pc.   | DF602150     |
| 602h  | Folded filters, 185 mm | 100 pc.   | DF602185     |
| 602h  | Folded filters, 240 mm | 100 pc.   | DF602240     |
| 602h  | Folded filters, 320 mm | 100 pc.   | DF602320     |
| 602h  | Filter circles, 70 mm  | 100 pc.   | DP602070     |
| 602h  | Filter circles, 90 mm  | 100 pc.   | DP602090     |
| 602h  | Filter circles, 110 mm | 100 pc.   | DP602110     |
| 602h  | Filter circles, 125 mm | 100 pc.   | DP602125     |
| 602h  | Filter circles, 150 mm | 100 pc.   | DP602150     |
| 602h  | Filter circles, 185 mm | 100 pc.   | DP602185     |
| 602h  | Filter circles, 240 mm | 100 pc.   | DP602240     |
| 604   | Folded filters, 90 mm  | 100 pc.   | DF604090     |
| 604   | Folded filters, 110 mm | 100 pc.   | DF604110     |
| 604   | Folded filters, 125 mm | 100 pc.   | DF604125     |
| 604   | Folded filters, 150 mm | 100 pc.   | DF604150     |

| Type  | Format                     | Pack size | Order number |
|-------|----------------------------|-----------|--------------|
| 604   | Folded filters, 185 mm     | 100 pc.   | DF604185     |
| 604   | Folded filters, 240 mm     | 100 pc.   | DF604240     |
| 604   | Folded filters, 320 mm     | 100 pc.   | DF604320     |
| 604   | Filter circles, 55 mm      | 100 pc.   | DP604055     |
| 604   | Filter circles, 90 mm      | 100 pc.   | DP604090     |
| 604   | Filter circles, 110 mm     | 100 pc.   | DP604110     |
| 604   | Filter circles, 125 mm     | 100 pc.   | DP604125     |
| 604   | Filter circles, 150 mm     | 100 pc.   | DP604150     |
| 604   | Filter circles, 185 mm     | 100 pc.   | DP604185     |
| 900   | Ø 19 x 90 mm               | 25 pc.    | 90019090     |
| 900   | Ø 22 x 80 mm               | 25 pc.    | 90022080     |
| 900   | Ø 22 x 100 mm              | 25 pc.    | 90022100     |
| 900   | Ø 25 x 60 mm               | 25 pc.    | 90025060     |
| 900   | Ø 25 x 70 mm               | 25 pc.    | 90025070     |
| 900   | Ø 25 x 80 mm               | 25 pc.    | 90025080     |
| 900   | Ø 25 x 100 mm              | 25 pc.    | 90025100     |
| 900   | Ø 28 x 60 mm               | 25 pc.    | 90028060     |
| 900   | Ø 28 x 80 mm               | 25 pc.    | 90028080     |
| 900   | Ø 28 x 100 mm              | 25 pc.    | 90028100     |
| 900   | Ø 30 x 80 mm               | 25 pc.    | 90030080     |
| 900   | Ø 30 x 100 mm              | 25 pc.    | 90030100     |
| 900   | Ø 33 x 60 mm               | 25 pc.    | 90033060     |
| 900   | Ø 33 x 80 mm               | 25 pc.    | 90033080     |
| 900   | Ø 33 x 90 mm               | 25 pc.    | 90033090     |
| 900   | Ø 33 x 94 mm               | 25 pc.    | 90033094     |
| 900   | Ø 33 x 100 mm              | 25 pc.    | 90033100     |
| 900   | Ø 33 x 118 mm              | 25 pc.    | 90033118     |
| 900   | Ø 33 x 130 mm              | 25 pc.    | 90033130     |
| 900   | Ø 33 x 205 mm              | 25 pc.    | 90033205     |
| 900   | Ø 35 x 150 mm              | 25 pc.    | 90035150     |
| 900   | Ø 40 x 100 mm              | 25 pc.    | 90040100     |
| 900   | Ø 40 x 123 mm              | 25 pc.    | 90040123     |
| 900   | Ø 40 x 150 mm              | 25 pc.    | 90040150     |
| 900   | Ø 43 x 123 mm              | 25 pc.    | 90043123     |
| 901   | Ø 26 (OD) x 60 mm (length) | 25 pc.    | 90126060     |
| BP002 | 460 mm x 570 mm            | 100 pc.   | BP0024657    |
| BP002 | 580mm x 600mm              | 100 pc.   | BP0025860    |
| BP003 | 580mm x 600mm              | 50 pc.    | BP0035860    |
| BP005 | 580mm x 600mm              | 25 pc.    | BP0055860    |
| CFV   | Ø 19 x 90 mm               | 25 pc.    | CFV19090     |
| CFV   | Ø 22 x 80 mm               | 25 pc.    | CFV22080     |
| CFV   | Ø 25 x 100 mm              | 25 pc.    | CFV25100     |
| CFV   | Ø 26 x 60 mm               | 25 pc.    | CFV26060     |
| CFV   | Ø 30 x 100 mm              | 25 pc.    | CFV30100     |
| CFV   | Ø 33 x 94 mm               | 25 pc.    | CFV33094     |
| CFV   | Ø 43 x 123 mm              | 25 pc.    | CFV43123     |
| GF6   | Filter circles, 25 mm      | 100 pc.   | GF6025       |
| GF6   | Filter circles, 47 mm      | 100 pc.   | GF6047       |
| GF6   | Filter circles, 50 mm      | 100 pc.   | GF6050       |
| GF6   | Filter circles, 55 mm      | 100 pc.   | GF6055       |

| Type       | Format                             | Pack size | Order number |
|------------|------------------------------------|-----------|--------------|
| GF6        | Filter circles, 70 mm              | 100 pc.   | GF6070       |
| GF6        | Filter circles, 90 mm              | 100 pc.   | GF6090       |
| GF6        | Filter circles, 100 mm             | 100 pc.   | GF6100       |
| GF6        | Filter circles, 125 mm             | 100 pc.   | GF6125       |
| GF6        | Filter circles, 142 mm             | 100 pc.   | GF6142       |
| GF6        | Filter circles, 185 mm             | 100 pc.   | GF6185       |
| GF6        | Filter circles, 293 mm             | 100 pc.   | GF6293       |
| GF8        | Filter circles, 90 mm              | 100 pc.   | GF8090       |
| GF8        | Round filter, 60 x 90 mm           | 100 pc.   | GF86090      |
| GF9        | Filter circles, 50 mm              | 100 pc.   | GF9050       |
| GF9        | Filter circles, 90 mm              | 100 pc.   | GF9090       |
| GF10       | Filter circles, 47 mm              | 100 pc.   | GF10047      |
| GF10       | Filter circles, 100 mm             | 100 pc.   | GF10100      |
| GF10       | Filter circles, 200 mm             | 100 pc.   | GF10200      |
| GF20       | Filter circles, 150 mm             | 250 pc.   | GF20150      |
| GF50       | Filter circles, 25 mm              | 100 pc.   | GF50025      |
| GF50       | Filter circles, 37 mm              | 100 pc.   | GF50037      |
| GF50       | Filter circles, 47 mm              | 100 pc.   | GF50047      |
| GF50       | Filter circles, 50 mm              | 100 pc.   | GF50050      |
| GF50       | Filter circles, 55 mm              | 100 pc.   | GF50055      |
| GF50       | Filter circles, 70 mm              | 100 pc.   | GF50070      |
| GF50       | Filter circles, 90 mm              | 100 pc.   | GF50090      |
| GF50       | Filter circles, 125 mm             | 100 pc.   | GF50125      |
| GF50       | Sheets , 203 mm x 254 mm           | 100 pc.   | GF50203254   |
| GF51       | Filter circles, 47 mm              | 100 pc.   | GF51047      |
| GF52       | Filter circles, 47 mm              | 100 pc.   | GF52047      |
| GF52       | Filter circles, 50 mm              | 100 pc.   | GF52050      |
| GF52       | Filter circles, 70 mm              | 100 pc.   | GF52070      |
| GF52       | Filter circles, 90 mm              | 100 pc.   | GF52090      |
| GF52       | Filter circles, 110 mm             | 100 pc.   | GF52110      |
| GF55       | Filter circles, 47 mm              | 100 pc.   | GF55047      |
| GF55       | Sheets, 60 x 90 mm                 | 100 pc.   | GF556090     |
| QFH        | Filter circles, 47 mm              | 50 pc.    | QFH047       |
| QFH        | Filter circles, 150 mm             | 50 pc.    | QFH150       |
| QFH        | Sheets , 203 mm x 254 mm           | 50 pc.    | QFH203254    |
| Drying pad | Strips 37 x 100 mm, 50 strips each | 100 pc.   | TB342750     |

Order numbers:

Membrane filters

| Type                  | Format                                  | Pack size | Order number |
|-----------------------|-----------------------------------------|-----------|--------------|
| Cellulose acetate     | 0.2 µm, non-sterile, white, 25 mm       | 100 pc.   | AC02025BL    |
| Cellulose acetate     | 0.2 µm, non-sterile, white, 47 mm       | 100 pc.   | AC02047BL    |
| Cellulose acetate     | 0.45 µm, non-sterile, white, 25 mm      | 100 pc.   | AC04525BL    |
| Cellulose acetate     | 0.45 µm, non-sterile, white, 47 mm      | 100 pc.   | AC04547BL    |
| Cellulose acetate     | 0.45 µm, non-sterile, white, 50 mm      | 100 pc.   | AC04550BL    |
| Cellulose acetate     | 0.45 µm, non-sterile, 142 mm            | 25 pc.    | AC045142BL   |
| Mixed Cellulose Ester | 0.2 µm, sterile, white, net, 47 mm      | 100 pc.   | MCES02047BC  |
| Mixed Cellulose Ester | 0.2 µm, sterile, white, net, 50 mm      | 100 pc.   | MCES02050BC  |
| Mixed Cellulose Ester | 0.45 µm, sterile, white, net, 47 mm     | 100 pc.   | MCES04547BC  |
| Mixed Cellulose Ester | 0.45 µm, sterile, white, net, 50 mm     | 100 pc.   | MCES04550BC  |
| Mixed Cellulose Ester | 0.2 µm, non-sterile, white, 50 mm       | 100 pc.   | MCE02050BL   |
| Mixed Cellulose Ester | 0.45 µm, non-sterile, white, net, 50 mm | 100 pc.   | MCE04550NC   |
| Mixed Cellulose Ester | 0.45 µm, non-sterile, white, 25 mm      | 100 pc.   | MCE04525BL   |
| Mixed Cellulose Ester | 0.45 µm, non-sterile, white, net, 47 mm | 100 pc.   | MCE04547BC   |
| Mixed Cellulose Ester | 0.45 µm, non-sterile, white, 47 mm      | 100 pc.   | MCE04547BL   |
| Mixed Cellulose Ester | 0.45 µm, non-sterile, white, net, 50 mm | 100 pc.   | MCE04550BC   |
| Mixed Cellulose Ester | 3 µm, non-sterile, white, 47 mm         | 100 pc.   | MCE30047BL   |
| Mixed Cellulose Ester | 5 µm, non-sterile, white, 47 mm         | 100 pc.   | MCE50047BL   |
| Mixed Cellulose Ester | 8 µm, non-sterile, white, 47 mm         | 100 pc.   | MCE80047BL   |
| Cellulose nitrate     | 0.2 µm, non-sterile, white, 25 mm       | 100 pc.   | NC02025BL    |
| Cellulose nitrate     | 0.2 µm, non-sterile, white, 47 mm       | 100 pc.   | NC02047BL    |
| Cellulose nitrate     | 0.2 µm, non-sterile, white, 50 mm       | 100 pc.   | NC02050BL    |
| Cellulose nitrate     | 0.2 µm, sterile, white,net, 47 mm       | 100 pc.   | NCS02047BC   |
| Cellulose nitrate     | 0.45 µm, non-sterile, black, net, 47 mm | 100 pc.   | NCS04547NC   |
| Cellulose nitrate     | 0.45 µm, non-sterile, black, net, 50 mm | 100 pc.   | NCS04550NC   |
| Cellulose nitrate     | 0.45 µm, non-sterile, white, 25 mm      | 100 pc.   | NC04525BL    |
| Cellulose nitrate     | 0.45 µm, non-sterile, white, net, 47 mm | 100 pc.   | NC04547BC    |
| Cellulose nitrate     | 0.45 µm, non-sterile, white, 47 mm      | 100 pc.   | NC04547BL    |
| Cellulose nitrate     | 0.45 µm, non-sterile, white, 50 mm      | 100 pc.   | NC04550BL    |
| Cellulose nitrate     | 0.45 µm, sterile, white, net, 47 mm     | 100 pc.   | NCS04547BC   |
| Cellulose nitrate     | 0.45 µm, sterile, white, 47 mm          | 100 pc.   | NCS04547BL   |
| Cellulose nitrate     | 0.8 µm, non-sterile, white, 47 mm       | 100 pc.   | NC08047BL    |
| Cellulose nitrate     | 0.8 µm, non-sterile, white, 50 mm       | 100 pc.   | NC08050BL    |
| Nylon                 | 0.2 µm, non-sterile, white, 47 mm       | 100 pc.   | NY02047BL    |
| Nylon                 | 0.45 µm, non-sterile, white, 47 mm      | 100 pc.   | NY04547BL    |
| PTFE                  | 0.2 µm, non-sterile, white, 25 mm       | 100 pc.   | PT02025BL    |
| PTFE                  | 0.2 µm, non-sterile, white, 47 mm       | 100 pc.   | PT02047BL    |
| PTFE                  | 0.45 µm, non-sterile, white, 25 mm      | 100 pc.   | PT04525BL    |
| PTFE                  | 0.45 µm, non-sterile, white, 47 mm      | 100 pc.   | PT04547BL    |
| PTFE                  | 5 µm, non-sterile, white, 47 mm         | 100 pc.   | PT50047BL    |
| PTFE                  | 5 µm, non-sterile, white, 90 mm         | 25 pc.    | PT50090BL    |

Syringe filters

| Type                  | Format                      | Pack size | Order number |
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| Cellulose acetate     | 0.2 µm, sterile, 25 mm      | 100 pc.   | SAC02025100  |
| Cellulose acetate     | 0.2 µm, sterile, 25 mm      | 50 pc.    | SACS0202550  |
| Cellulose acetate     | 0.2 µm, sterile, 30 mm      | 50 pc.    | SACS0203050  |
| Cellulose acetate     | 0.45 µm, non-sterile, 25 mm | 100 pc.   | SAC04525100  |
| Cellulose acetate     | 0.45 µm, non-sterile, 25 mm | 500 pc.   | SAC04525500  |
| Cellulose acetate     | 0.45 µm, non-sterile, 30 mm | 100 pc.   | SAC04530100  |
| Cellulose acetate     | 0.45 µm, non-sterile, 30 mm | 500 pc.   | SAC04530500  |
| Cellulose acetate     | 0.45 µm, sterile, 25 mm     | 50 pc.    | SACS0452550  |
| Cellulose acetate     | 0.45 µm, sterile, 30 mm     | 50 pc.    | SACS0453050  |
| Nylon                 | 0.2 µm, non-sterile, 13 mm  | 100 pc.   | SNY02013100  |
| Nylon                 | 0.2 µm, non-sterile, 25 mm  | 100 pc.   | SNY02025100  |
| Nylon                 | 0.2 µm, non-sterile, 25 mm  | 500 pc.   | SNY02025500  |
| Nylon                 | 0.45 µm, non-sterile, 13 mm | 100 pc.   | SNY04513100  |
| Nylon                 | 0.45 µm, non-sterile, 25 mm | 100 pc.   | SNY04525100  |
| Nylon                 | 0.45 µm, non-sterile, 25 mm | 500 pc.   | SNY04525500  |
| PTFE                  | 0.2 µm, non-sterile, 13 mm  | 100 pc.   | SPT02013100  |
| PTFE                  | 0.2 µm, non-sterile, 25 mm  | 100 pc.   | SPT02025100  |
| PTFE                  | 0.45 µm, non-sterile, 13 mm | 100 pc.   | SPT04513100  |
| PTFE                  | 0.45 µm, non-sterile, 25 mm | 100 pc.   | SPT04525100  |
| PTFE                  | 0.45 µm, non-sterile, 25 mm | 500 pc.   | SPT04525500  |
| PTFE                  | 0.45 µm, non-sterile, 30 mm | 100 pc.   | SPT04530100  |
| Regenerated Cellulose | 0.2 µm, non-sterile, 13 mm  | 100 pc.   | SCR02013100  |
| Regenerated Cellulose | 0.2 µm, non-sterile, 25 mm  | 100 pc.   | SCR02025100  |
| Regenerated Cellulose | 0.45 µm, non-sterile, 13 mm | 100 pc.   | SCR04513100  |
| Regenerated Cellulose | 0.45 µm, non-sterile, 25 mm | 100 pc.   | SCR04525100  |
| Regenerated Cellulose | 0.45 µm, non-sterile, 30 mm | 100 pc.   | SCR04530100  |

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| 1507    | 63     | 8272    | 79   |              |      |
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| 1574    | 69     | BP002   | 93   |              |      |
| 1575    | 69     | BP003   | 93   |              |      |
| 1577    | 69     | BP005   | 93   |              |      |
| 2043a   | 99     | CFV     | 91   |              |      |
| 2043b   | 99     | GF10    | 71   |              |      |



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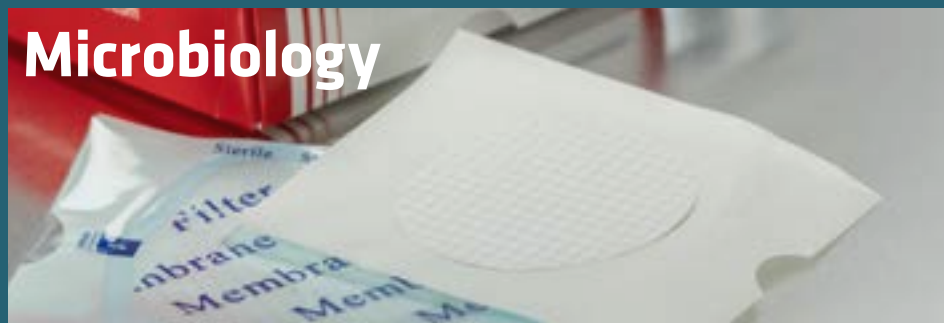
## Medical diagnostics/ PoC-papers



## Molecular biology



## Microbiology



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