



Filter Papers for the Laboratory and Industry

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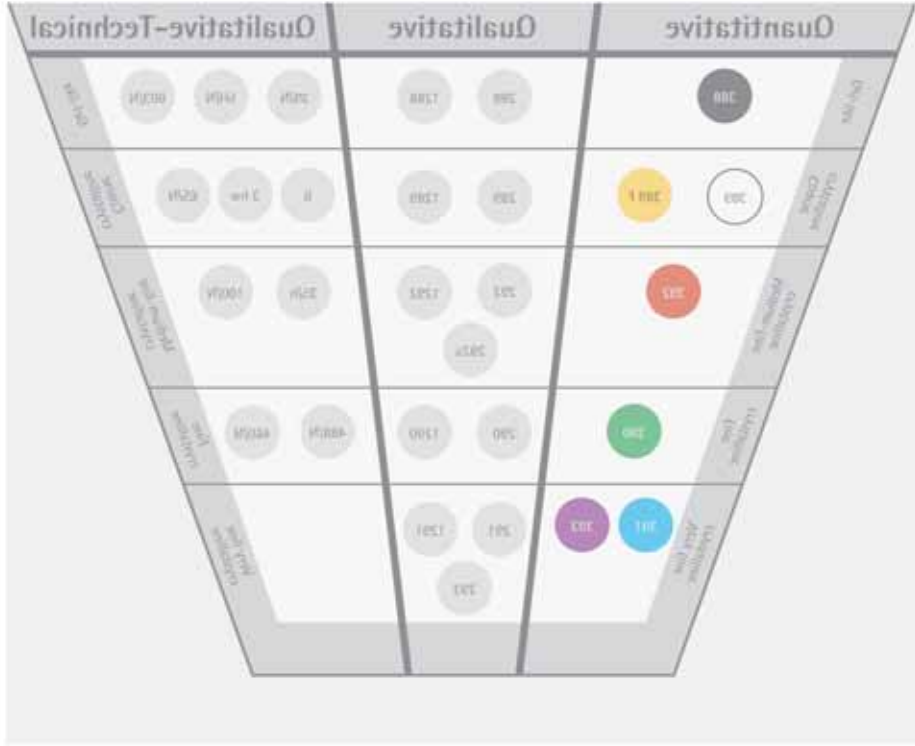
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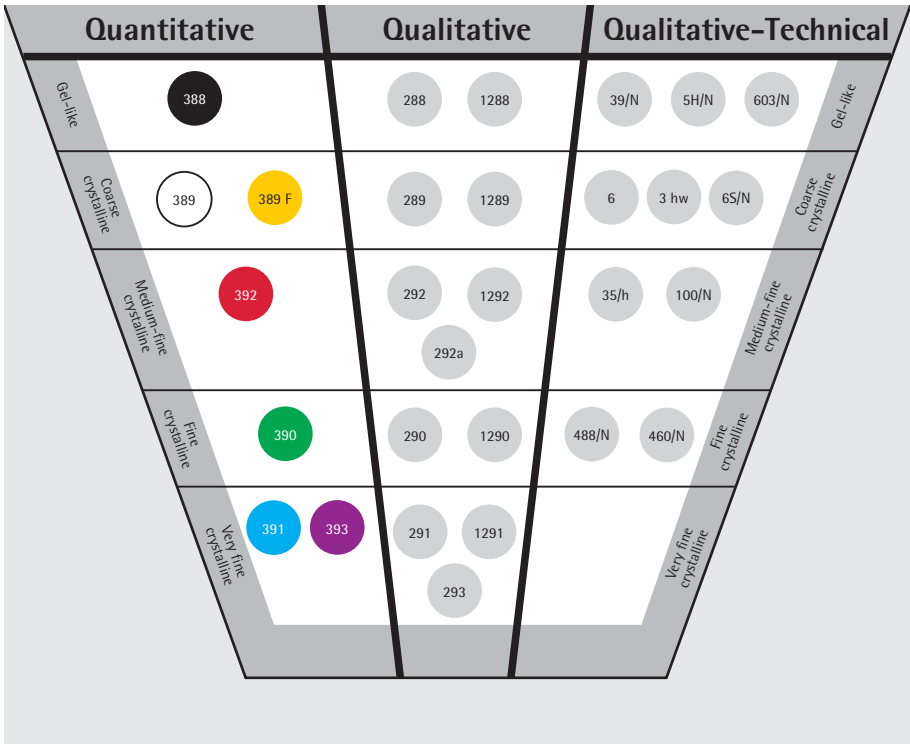
Analytical Filter Papers

Product Overview of Frequently Used



- 
Purple spot
 Lowest rate of filtration amongst the quantitative filter papers extra fine-pored and dense, most efficient collection of smallest particles, ash-free
- 
Blue spot
 Very low rate of filtration, fine-pored, very dense, ash-free
- 
Green spot
 Low rate of filtration, narrow-pored, dense, ash-free
- 
Red spot
 Moderate rate of filtration, medium density, ash-free
- 
Yellow spot
 Medium-fast rate of filtration, medium wide-pored, ash-free, low-fat content, especially for determination in natural raw materials
- 
White spot
 High rate of filtration, medium wide-pored, ash-free
- 
Black spot
 Very high rate of filtration, wide-pored, spongy structure, ash-free
- 
Grey spot
 Various technical specifications

Product Overview of Frequently Used Analytical Filter Papers



- 
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 Lowest rate of filtration amongst the quantitative filter papers, extra fine-pored and dense, most efficient collection of smallest particles, ash-free
- 
Blue spot
 Very low rate of filtration, fine-pored, very dense, ash-free
- 
Green spot
 Low rate of filtration, narrow-pored, dense, ash-free
- 
Red spot
 Moderate rate of filtration, medium density, ash-free
- 
Yellow spot
 Medium-fast rate of filtration, medium wide-pored, ash-free, low-fat content, especially for fat determination in natural raw materials




- 
White spot
 High rate of filtration, medium wide-pored, ash-free
- 
Black spot
 Very high rate of filtration, wide-pored, spongy structure, ash-free
- 
Grey spot
 Various technical specifications

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Sartorius Offers a Broad Range of Filter Papers

Special Products for Your Filtration Needs

We are pleased to present you with our updated catalogue featuring a large assortment of filter paper products.

The goal of our company is to supply you with high-grade filter papers to cover your laboratory needs and help you accomplish all your filtration tasks and solve any problems you may encounter.

Already in the mid 1800s, Sartorius – formerly Filtrak | Gessner & Kreuzig – began to produce filter papers in the Saxon Erzgebirge (Erz Ore Mountains), the mountain range located between the eastern part of Germany and what is now the Czech Republic. The company made these filters for the famous Bohemian brewery in Pilsen, among others. Since then, experienced specialists have continuously enhanced our products and adapted them to meet the latest technical and scientific standards. As a result, we have developed one of the widest varieties of filter papers available today, and invite you to discover their capabilities.

In the future as well, Sartorius will continue to incorporate the latest scientific advances and cutting-edge technology into its products and address environmental concerns in ongoing product development projects. As part of this effort, Sartorius has considerably expanded its product array.

Beyond this, we are ready to assist you in finding the best product solutions for your specific filtration applications, and will be happy to provide you with technical advice and comprehensive support.

Our product range include

- Ashless filter papers
- Qualitative filter papers
- Qualitative and technical filter papers
- Absorptive filter papers and boards
- Glass and quartz micro fibre filters
- Blotting and chromatography papers
- Indicator papers
- Extraction thimbles

About Sartorius Filter Papers and the Raw Materials Used

Generally, filter papers are used for separating the solid particles from liquids and gases.

They are absorbent, porous non-woven fiber materials. Their fibrous structure forms inter-capillary spaces within the capillary system; the size and number of these spaces depends on the type of raw materials used and on the action of the beater rolls in the paper-making machine or on the machine's operating characteristics.

We use natural and synthetic as well as organic and inorganic fibrous materials to manufacture our filter papers. To give them special properties, we chemically treat some of these materials or impregnate them with synthetic resins.

Sartorius filter papers are primarily made of cellulose pulp obtained from pine or spruce; however, we also use pulp made of birch, beech and eucalyptus wood, or cotton linters and viscose pulp. These raw materials are refined to obtain various grades of filter papers by a process called "wet beating" in hollanders – beater rolls – and by sheet formation on specially modified paper machines.

Quality Assurance and Control

Particular attention is paid to continuous in-process quality control; additionally, regular checks and exact analyses of raw material and of each individual finished product assure constant high quality and product uniformity.

What Is Filtration and for What Purposes Is It Used?

Filtration is a process for separating two substances of two different physical states. It is used to remove solids from liquids or gases.

How Do Filter Papers Work?

Filter papers are so-called depth filters. Various parameters influence their effectiveness: Mechanical particulate retention, adsorption, pH, surface properties, thickness and strength of the filter paper as well as the shape, density and quantity of particles to be retained.

The particles deposited on the filter form a "filter cake," which depending on its density increasingly governs the progress of a filtration run. This decisively affects the retention capability. For this reason, it is essential to select the right filter paper to ensure effective filtration. This choice also depends on the filtration method to be used, among other factors. In addition, the filter paper grade, the properties of the medium to be filtered, the size of the particulate solids to be removed and the required degree of clarification are all decisive in making the right choice. In this catalogue you will find typical examples intended to help you select the filter paper that is right for your application.



Sartorius Filter Paper Types

Ashless Filter Papers for Quantitative Analyses

These filter papers are used for quantitative analysis. They are made of refined pulp and linters with over 95% alpha-cellulose content. Moreover, these filter papers are guaranteed to be free of any residual acids that are used in a few production methods. Another advantage is their extremely low percentage of ash content. As a result, these filters are virtually ash-free.

Sartorius Ashless Filter Papers, with the grade Numbers 388, 389, 389F, 390, 391, 392 and 393, are characterized by high wet strength and high purity, classified according to their separating capacity.

These papers are especially suitable for quantitative analysis, Buechner funnels, pressure or vacuum filtration and are available in different formats as in rolls, sheets, discs, and folded filters.

To make it easy for you to select the product best for your needs, the boxes are identified with color-coded dots as follows:

- **388: black dot**
- **389: white dot**
- **389F: yellow dot**
- **390: green dot**
- **391: blue dot**
- **392: red dot**
- **393: purple dot**

In the list on pages 8 of this catalogue, you will find information on the key filtration properties of our filter papers for quantitative analyses, including application examples, to help guide your selection.

Qualitative Filter Papers

Like our ashless filter papers, these filter papers are made of refined pulp and linters with more than 95% alpha-cellulose content. This gives them a variety of filter properties to meet the needs of different applications. The ash content of these filter papers is approx. <0.1%, and they are essentially used for qualitative analyses. Sartorius offers two categories of qualitative filter paper: standard strength and various grades of wet strength. These filter papers are likewise available as rolls, sheets, disks and folded filters.

288 and 1288
289 and 1289
290 and 1290
291 and 1291
292 and 1292
292a | 293

On pages 9 and 10 of this catalogue, you will find a list of properties and application examples.

Qualitative and Technical Filter Papers

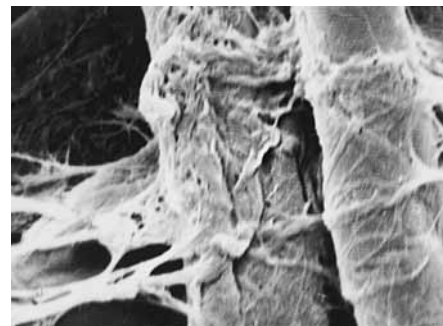
We offer a selection of filter papers for analytical and technical purposes.

For guidance on selecting the right grade, please refer to pages 15 and 16, which describe the properties of each grade and provide application examples.

Absorptive Filter Papers and Boards

These papers are used for filtration of cooking and transformer oils, galvanic baths, as absorptives of human serum, of water for germination tests, as base paper for further impregnation with certain reagents or to protect laboratory surfaces. They are available as reels sheets or discs, also of large diameters with a centre hole, special cuts and shapes, e.g. for use in filter presses. Find more details on pages 17 and 18.

Microscopic view of cellulose fibers bound in a filter paper



Non-bound cellulose fibers under a microscope



Cross section of a filter paper under a microscope

Glass and Quartz Microfiber Filters

Glass microfiber filters are made of 100% borosilicate. No binders are used in their production, which makes them ideal for critical analyses in which impurities can be washed out of the filter. They continue to perform over long periods unlike cellulose filters whose rate of filtration drops off rapidly as the particulate load increases. Moreover, glass microfiber filters are temperature resistant up to 500°C.

The properties of quartz microfiber filters are similar to those of glass microfiber filters. The differences are that quartz microfiber filters are resistant to even higher temperatures of up to 900–950°C, have only a minimum of trace metal impurities, feature excellent weight and dimensional stability, and can be used for analysis of hot, acidic gases (except HF), especially for emission and immission test methods.

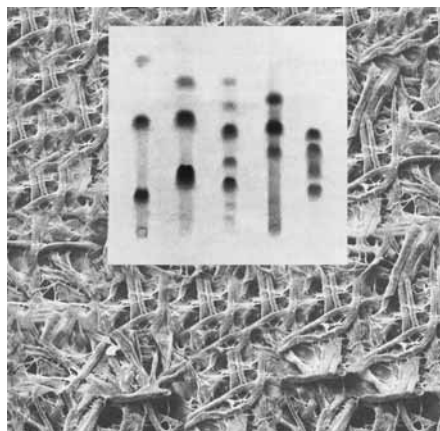
Glass and quartz microfiber filters are suitable as general-purpose membrane prefilters for measurement and analysis of air and water pollutants and for clarification of buffers and reagents, especially for spectrophotometry. The filters are available as discs, sheets or thimbles.

Different densities and thicknesses of the materials define the specific filtration characteristics of each of the following grades:

MGA, MGB, MGC, MGD, MGF, T293, 40

See pages 29 to 34 for more information.

Blotting and Chromatography Papers



These filter products are made of high-purity cotton linters with an alpha-cellulose content of over 97%. We offer these filters in 16 grades, which are differentiated by their base weight and their migration rate. Choose from eleven grades with normal ash content and eight grades with reduced ash content.

Chromatography papers with a reduced ash content are available in grades FN 1 to FN8, FN 30 and FN 100. For these papers, the long side is the direction of motion. They can also be supplied in disc formats for circular technology and as strips or sheets for special techniques.

Moreover, we offer papers for absorption and transport of buffers or to cover gel and transfer membranes on both sides in a blotting tank to accommodate various transfer blotting techniques.

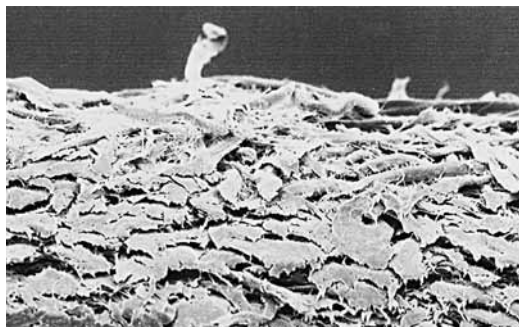
BF 1, BF 2, BF 3, BF 4, FN 100

for use as blotting or chromatography papers; see page 26 to 28.

Indicator Papers

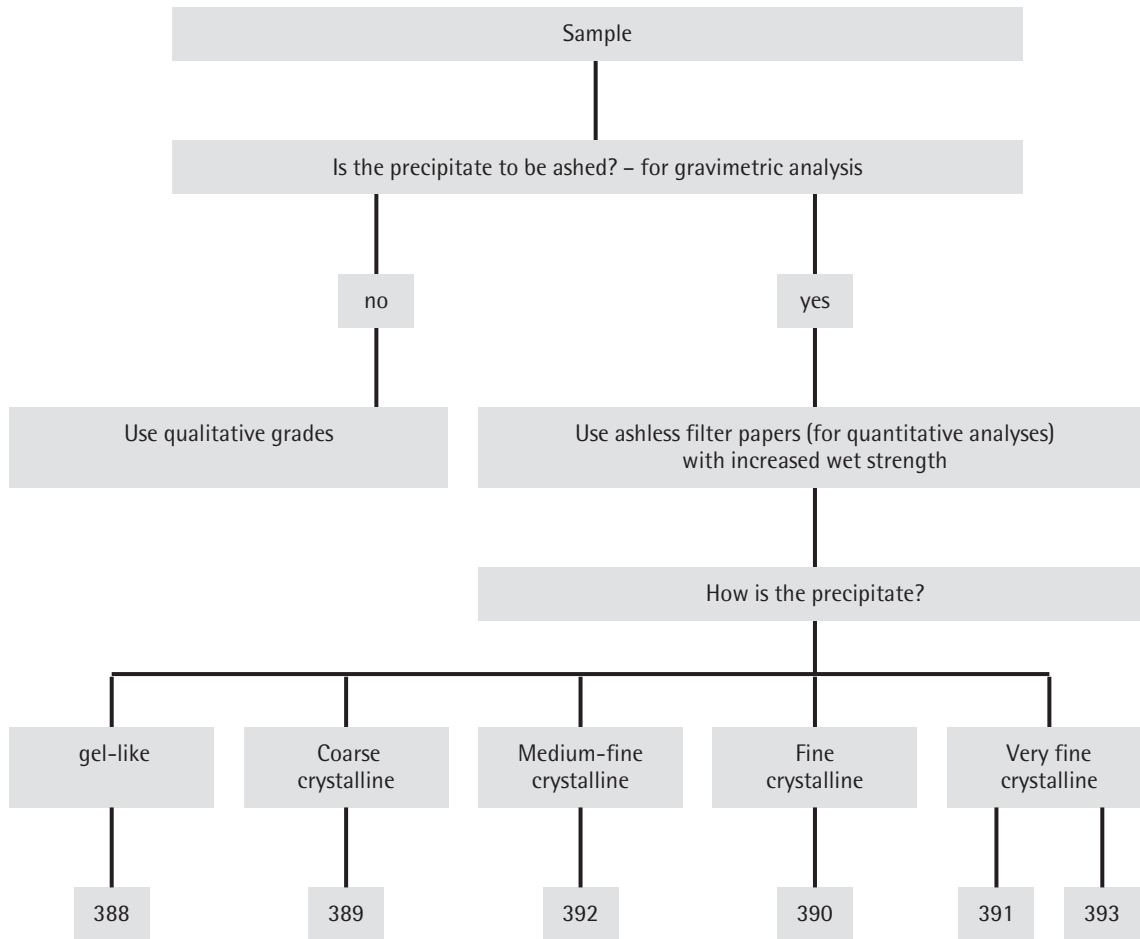
Sartorius offers a comprehensive assortment of ready-to-use indicator pH and test papers available as strips or on roller dispensers. They are used for quick and accurate determination of colored, turbid, clear or aqueous solutions within the entire pH range.

Beyond this category, we also supply exceptionally pure special papers designed for coating with pH indicators or test reagents. We will be happy to provide customized roll or sheet dimensions. For more information, please refer to pages 24 and 25.

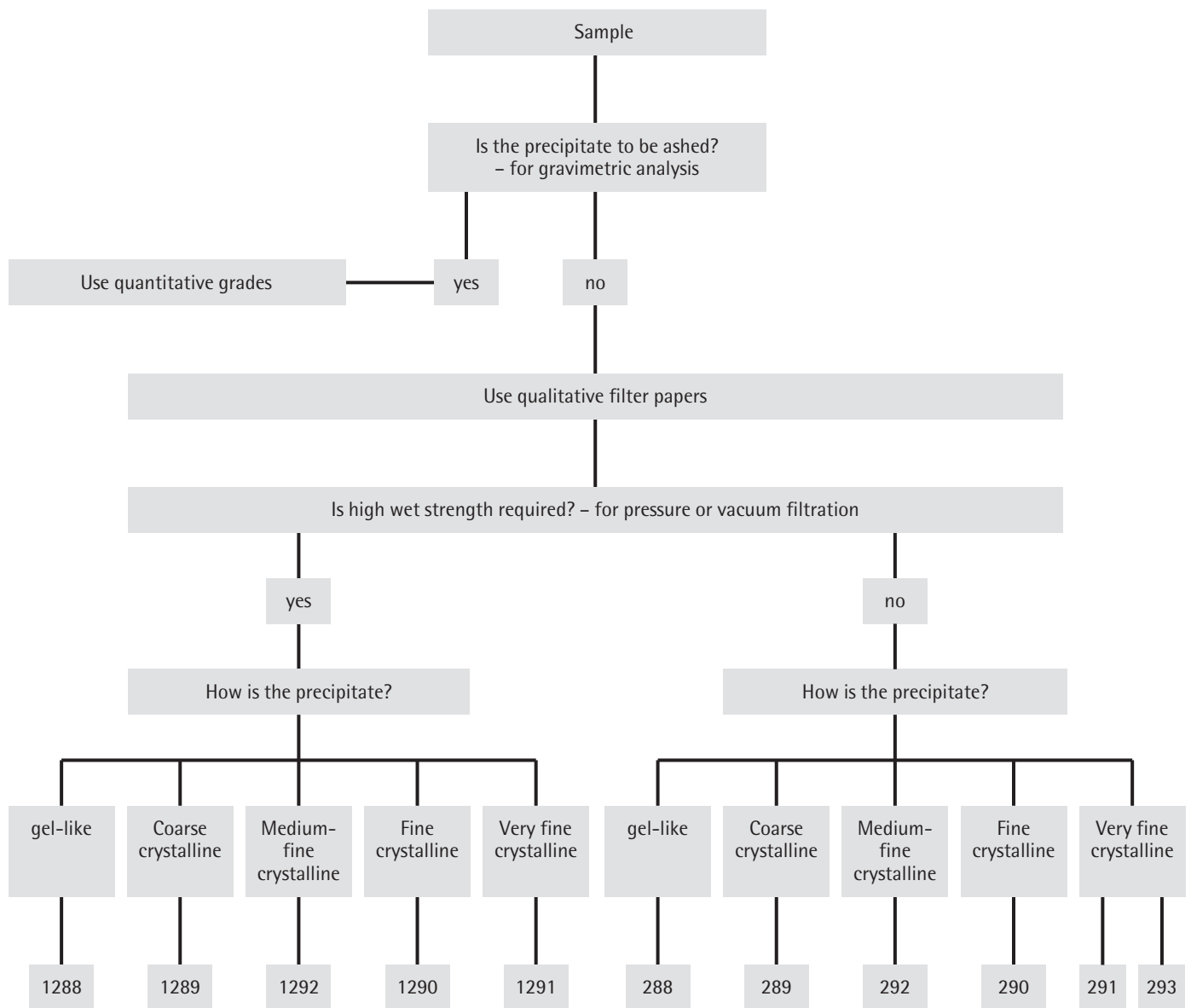


Surface of a filter paper under a microscope

Selection of Quantitative Filter Paper Grade



Selection of Qualitative Filter Paper Grade



Ashless Filter Papers for Quantitative Analyses with Increased Wet Strength



Filtration using a folded filter in an analytical funnel



Vacuum filtration using a filter disc in a Buechner funnel (right side). Courtesy of Phywe Systeme GmbH

| Grade | Serial no. | g/m ² | Particle retention (µm) | Fv (s)* | Properties | Preferable application areas |
|------------|------------|------------------|-------------------------|---------|---|---|
| 388 ● | 101 | 84 | 12–15 | 10 | Wide-pored, soft and spongy structure, fast rate of filtration, wet strength, ash-free** | Coarse-flocculent and voluminous precipitates, especially iron, aluminum and chromium hydroxides; copper, bismuth, cobalt and iron sulfides; various organic, colored metal deposits; determination of silicon in analysis of steel and pig iron; for acidic and slightly alkaline solutions; pressure filtration |
| 389 ○ | 102 | 84 | 8–12 | 20 | Medium-wide-pored, medium-fast rate of filtration, wet strength, ash-free* | The most commonly used grade for analyses; for relatively coarse precipitates such as silver, arsenic, antimony, cadmium, lead, iron and manganese sulfides; lead chromate; ammonium phosphorous molybdate; alkaline earth carbonates, etc.; for acidic and slightly alkaline solutions; pressure filtration |
| 389 F ● | 112 | 84 | 8–12 | 20 | Medium-fast-wide-pored, medium rate of filtration, wet strength ash-free** | Relatively coarse precipitates; ideal for determining the fat content in natural raw materials |
| 390 ● | 103 | 84 | 3–5 | 100 | Narrow-pored, dense, slow rate of filtration, wet strength, ash-free** | Filtration of fine precipitates; barium sulfate; lead molybdate; lead dioxide; calcium hydroxide; calcium fluoride; nickel sulfide; zinc sulfide; stannic sulfide, etc.; for acidic and slightly alkaline solutions; pressure filtration |
| 391 ● | 104 | 84 | 2–3 | 180 | Fine-pored, highly dense, very slow rate of filtration, wet strength, ash-free** | Ideal for particularly difficult filtration conditions and especially fine-grained precipitates; cold-precipitated barium sulfate; meta-stannic acid; copper oxide, etc.; for acidic and slightly alkaline solutions; pressure filtration |
| 392 ● | 105 | 84 | 5–8 | 50 | Medium density, moderately fast rate of filtration, wet strength, ash-free** | Rapid filtration of fine precipitates; magnesium ammonium phosphate; magnesium ammonium arsenate; relatively coarse forms of barium sulfate; for acidic and slightly alkaline solutions; pressure filtration |
| 393 ● | 127 | 100 | 1–2 | 250 | Especially fine-pored, lowest rate of filtration among all filter paper grades, dense, highly efficient filtration of the most minute particles, ash-free** | Ideal for particularly difficult filtration conditions and especially fine-grained precipitates; barium sulfate, etc.; copper oxide |

* Filtration rate in seconds: see page 37

** Ash content ≤ 0.01% according to DIN 54370: see page 37

Analytical Filter Papers for Qualitative Analyses



Disc filter, folded by one quarter



Completely folded filter
Courtesy of Phywe Systeme GmbH

| Grade | Serial no. | g/m ² | Particle retention (µm) | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|-------------------------|---------|---|---|
| 288 | 201 | 80 | 12–15 | 10 | Wide-pored, soft and spongy structure, fast rate of filtration | Coarse-flocculent and voluminous precipitates, especially iron, aluminum and chromium hydroxides; copper, bismuth, cobalt and iron sulfides; various organic colored metal deposits; determination of silicon in analysis of steel and pig iron, etc. |
| 289 | 202 | 80 | 8–12 | 20 | Medium-wide-pored, medium rate of filtration | The most commonly used grade for many analyses; for relatively coarse precipitates such as silver, arsenic, antimony, cadmium, lead, iron and manganese sulfides; lead chromate; ammonium phosphorous molybdate; alkaline earth carbonates, etc. |
| 290 | 203 | 80 | 3–5 | 100 | Narrow-pored, dense, slow rate of filtration | Filtration of fine precipitates; barium sulfate; lead molybdate; lead dioxide; calcium hydroxide; calcium fluoride; nickel sulfide; zinc sulfide; stannic sulfide, etc. |
| 291 | 204 | 80 | 2–3 | 180 | Fine-pored, highly dense, very slow rate of filtration | Fine-grained precipitates; cold-precipitated barium sulfate; meta-stannic acid |
| 292 | 205 | 87 | 5–8 | 45 | Medium density, moderately fast rate of filtration | Routine laboratory work; rapid filtration of fine precipitates; magnesium ammonium phosphate; magnesium ammonium arsenate; relatively coarse forms of barium sulfate, etc. |
| 292 a | 215 | 97 | 4–7 | 60 | Slightly denser and thicker than 292, medium- to narrow-pored, moderately fast rate of filtration | Filtration of fine precipitates; magnesium ammonium phosphate; magnesium ammonium arsenate; relatively coarse forms of barium sulfate, etc. |
| 293 | 211 | 80 | 1–2 | 300 | Especially fine-pored, lowest rate of filtration among all filter paper grades, dense, highly efficient filtration of the most minute particles | Ideal for particularly difficult filtration conditions and especially fine-grained precipitates; barium sulfate; copper oxide; common, often specified grade for clarification of wine |

* Filtration rate in seconds: see page 37

Analytical Filter Papers with Increased Wet Strength for Vacuum or Pressure Filtration and for Qualitative Analyses

| Grade | Serial no. | g/m ² | Particle retention (µm) | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|-------------------------|---------|--|---|
| 1288 | 206 | 84 | 12–15 | 10 | Wide-pored, soft and spongy structure, fast rate of filtration, wet strength | Coarse-flocculent and voluminous precipitates, especially iron, aluminum and chromium hydroxides; copper, bismuth, cobalt and iron sulfides; various organic, colored metal deposits; determination of silicon in analysis of steel and pig iron; for acidic and slightly alkaline solutions; pressure filtration |
| 1289 | 207 | 84 | 8–12 | 20 | Medium-wide-pored, medium-fast rate of filtration, wet strength | The most commonly used grade for analyses; for relatively coarse precipitates such as silver, arsenic, antimony, cadmium, lead, iron and manganese sulfides; lead chromate; ammonium phosphorous molybdate; alkaline earth carbonates; for acidic and slightly alkaline solutions; pressure filtration |
| 1290 | 208 | 84 | 3–5 | 100 | Narrow-pored, dense, slow rate of filtration, wet strength | Filtration of fine precipitates; barium sulfate; lead molybdate; lead dioxide; calcium hydroxide; calcium fluoride; nickel sulfide; zinc sulfide; stannic sulfide; for acidic and slightly alkaline solutions; pressure filtration |
| 1291 | 209 | 84 | 2–3 | 180 | Fine-pored, highly dense, very slow rate of filtration, wet strength | Ideal for particularly difficult filtration conditions and especially fine-grained precipitates; cold-precipitated barium sulfate; meta-stannic acid; copper oxide; for acidic and slightly alkaline solutions; pressure filtration |
| 1292 | 210 | 84 | 5–8 | 50 | Medium density, moderately fast rate of filtration, wet strength | Rapid filtration of fine precipitates; magnesium ammonium phosphate; magnesium ammonium arsenate; relatively coarse forms of barium sulfate; for acidic and slightly alkaline solutions; pressure filtration |

* Filtration rate in seconds: see page 37

Filter Papers for Use in Breweries

We recommend filter paper grades 6, 41b and 292 for malt filtration and analysis according to EBC standards and for degassing beer before analysis. Grade 470 is made of cellulose and diatomaceous earth. As it is thicker and denser than the other paper grades designed for use in breweries, grade 470 is often used to retain finer precipitates in malt.



| Grade | Serial no. | g/m ² | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|---------|---|--|
| 41b | 462 | 75 | 22 | Medium-fast rate of filtration, smooth | All-purpose filter; preferably recommended for malt and beer analysis or degassing in brewery laboratories according to EBC standards; primarily used as folded filters with a diameter of 185, 240 or 320 mm |
| 6 | 312 | 80 | 15 | Thicker and faster rate of filtration, stronger wet burst resistance than grade 41b, smooth | All-purpose filter; also recommended for malt and beer analysis or degassing like grade 41b; beyond these applications, also suitable for relatively coarse or gelatinous precipitates; primarily used as folded filters with a diameter of 185, 240 or 320 mm |
| 292 | 205 | 87 | 45 | Medium density, medium-fast rate of filtration | Routine laboratory applications; rapid filtration of fine precipitates in malt before further analysis according to EBC standards; primarily used as folded filters with a diameter of 185, 240 or 320 mm |
| 289 | 202 | 80 | 20 | Medium-wide-pored, medium-fast rate of filtration | For routine filtration in analysis of malt |
| 470 | 606 | 140 | 80 | Made of cellulose and diatomaceous earth, slow rate of filtration, thick, smooth | Filtration of the finest precipitates in malt or beer before analysis; ideal for spectrophotometric analyses |

* Filtration rate in seconds: see page 37

Filter Papers for Use in Winery Laboratories

The following filter papers are ideal for clarifying wine before further analysis. They retain the finest precipitates before determination of the alcohol, acid and glucose content or color using spectrophotometry. These filters are used in folded formats with relatively large diameters.



| Grade | Serial no. | g/m ² | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|---------|---|--|
| 293 | 211 | 80 | 300 | Especially fine-pored, dense, slow rate of filtration, highly efficient filtration of the most minute particles | Ideal for particularly difficult filtration conditions and especially fine-grained precipitates; standard filter papers for wine clarification. Often used as folded filters with diameters >150 mm. |
| 470 | 606 | 140 | 80 | Made of cellulose and diatomaceous earth, thick, slow rate of filtration, smooth | The standard grade for clarification of wine with a relatively high sugar content; filters very fine precipitates faster than 293. Often used as folded filters with a diameter of 125, 150 or 185 mm. |
| 3 hw | 303 | 65 | 20 | Medium-fast filtration rate; increased wet strength, smooth | Standard filter paper for clarification of wine. Frequently used as a folded filter. |
| 37/N | 480 | 135 | 4 | Soft, extra-large pores; filtration rate same as for 39/N; but thinner; crêped | Standard filter paper for wine clarification. Frequently used as a folded filter. |
| 39/N | 483 | 180 | 4 | Soft, extra-large pores; filtration rate same as for 37/N, but extra-thick and with higher wet strength; crêped | For fast removal of highly coarse contaminants under vacuum/pressure; for liquids of higher viscosity, such as syrup, fruit juices, emulsions. |

* Filtration rate in seconds: see page 37

Filter Papers for Use in Sugar Laboratories

Filter papers are used in laboratories to assay sugar beet or cane sugar. These are mashed and further analyzed according to the aluminum sulfate method. Potassium, nitrogen, sodium and saccharose content are measured using a spectrophotometer.

Sugar beets



Sugar cones, sugar cubes



Sugar cane

| Grade | Serial no. | g/m ² | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|---------|---|--|
| 100/N | 328 | 85 | 30 | Medium-fast rate of filtration, medium thickness, low potassium and sodium content, extremely high wet burst resistance | Specially suitable for saccharose; potassium, nitrogen and sodium assays in beet or cane sugar according to the aluminum sulfate method using a VENEMA system. Available as discs, quarter-folded or completely folded filters in standard diameters of 240 mm; can also be supplied on rolls. |
| 3 hw | 303 | 65 | 20 | Medium-fast rate of filtration, increased wet strength, smooth | Sugar juices, sugar solutions; clarifying filtration of clarified extracts, dried sugar beet shreds or juices with a low viscosity. Available as discs, quarter-folded or completely folded filters in standard diameters of 240 mm. |
| 6 S/N | 314 | 145 | 12 | Fast rate of filtration, extra thick, creped, high wet burst resistance | Filtration of syrup and sugar solutions with a relatively high viscosity. Available as discs, quarter-folded or completely folded filters in standard diameters of 240 mm. |
| 601/N | 354 | 65 | 13 | Thin, fast rate of filtration, creped, normal wet strength | All-purpose filtration of solutions with a relatively low viscosity; standard grade for assay of the sugar content in sugar cane. Available as discs, quarter-folded or completely folded filters in standard diameters of 240 mm. |
| 470 | 606 | 140 | 80 | Made of cellulose and diatomaceous earth, slow rate of filtration, thick, smooth | Used for enhanced clarification of highly turbid sugar solutions before further analysis. Available as discs, quarter-folded or completely folded filters in standard diameters of 240 mm. |

* Filtration rate in seconds: see page 37

Filter Papers for Determining the Germination Capability of Seeds

These paper grades are ideal for ensuring an optimal moisture content for the most diverse types of seeds and germination forms. They feature excellent wet strength, and their special structure prevents fine seed roots from growing through. These filter papers can be supplied in customized shapes and sizes for testing seeds according to ISTA (International Seed Test Association). We offer you the following formats: paper strip formats with a predefined number of pleats according to NEEB and the Copenhagen tank system (Jacobsen), for instance, for testing beet seeds; filter discs or rectangles for testing seeds in petri dishes (osmosis test) or on top of paper, such as for testing grass or other types of small seeds; unpleated strips to form rolls from either a creped, plain or polyethylene-coated paper for testing the germination capability according to the "Vienna roll method," e.g., grain or pea seeds.



| Grade | Serial no. | g/m ² | Fv (s)* | Capillary rise** mm/10 min. | Properties | Preferable application areas | Size in mm | Quantity/package |
|--------|------------|------------------|---------|-----------------------------|---|---|--------------------------|------------------|
| 50 S | 353 | 120 | 30 | 100 | Relatively thick paper, absorbent, increased wet strength, smooth, white | Ideal for use as germination test paper for testing seeds according to NEEB and the Copenhagen tank method; available as pre-pleated strips that fit in a plastic cup, e.g., for beet seeds | 2,000 × 110 50 pleats | 350 |
| 51 S | 366 | 120 | 30 | 100 | Relatively thick paper, absorbent, increased wet strength, smooth, gray | Ideal for use as germination test paper for testing seeds according to NEEB and the Copenhagen tank method; colored for easier identification of white seeds; available as pre-pleated strips that fit in a plastic cup, e.g., for beet seeds | 2,000 × 110 50 pleats | 350 |
| 6 | 312 | 80 | 15 | | Relatively thick and faster rate of filtration, increased wet strength, white, smooth | All-purpose filter paper, used as a substrate or as wicking paper for irrigation in a Copenhagen tank system | 580 × 110 | 350 |
| 6 S/N | 314 | 145 | 12 | | Very high rate of filtration, extra thick, increased wet strength, white, creped | Interleaving filters for "between papers" method for relatively large seeds, e.g., grain or pea seeds, "Vienna roll method" | 150 × 180 85 × 145 | 250 250 |
| 601/PE | 601 | 140 | | | Polyethylene-coated on one side, impermeable, highly absorbent | For testing the germination capability of relatively large seeds, e.g., grain seeds, "rolled towel" and "between papers" methods | 185 × 400 | 250 |

* Filtration rate in seconds: see page 37

** Capillary rise in mm/10 min or mm/30 min acc. to KLEMM and DIN ISO 8787: see page 37

Clarification of Liquids using Qualitative and Technical Filter Papers for Less Critical Routine Analyses*

| Grade | Serial no. | g/m ² | Fv (s)** | Properties | Preferable application areas |
|--------|------------|------------------|----------|--|---|
| FT 55 | 348 | 55 | 5 | Fast rate of filtration, extra thin, creped | Rapid clarification of coarse contaminants or impurities; galvanic baths; for use as articulation paper for dental impression trays |
| 3 h | 302 | 65 | 35 | Slow to moderately fast rate of filtration, thin, smooth | Extract solutions; sera; spices; general laboratory filtration |
| 3 hw | 303 | 65 | 20 | Moderately fast rate of filtration, thin, smooth | Essential oils; essences; salt solutions; tinctures; spirits; standard grade for routine laboratory analyses |
| 3 m/N | 305 | 65 | 30 | Moderately fast rate of filtration, thin, smooth, increased wet strength | Acids; for general vacuum or pressure filtration applications and for less critical analyses; also used to assay the sucrose content in cane sugar solutions with a relatively low viscosity |
| 3 w | 308 | 65 | 15 | Medium-fast rate of filtration, thin, smooth | Boric acid solution; essences; hair tonics; eau de cologne; tinctures |
| 488/N | 333 | 65 | 60 | Thinner, but denser and with a slower rate of filtration than 460/N, wet strength | Slower filtration of tannin solutions, potash (potassium carbonate), acids, cloudy protein solutions, galvanic baths; pressure and vacuum filtration |
| 601/N | 354 | 65 | 13 | Thin, medium-fast rate of filtration, creped, wet strength | General laboratory filtration and less critical analyses; also suitable for assaying the sucrose content in cane sugar |
| 1602/N | 342 | 70 | 5 | Medium-fast rate of filtration, creped | All-purpose filter papers for even faster clarification than with grade 603 before performing less critical analyses of highly viscous solutions |
| 4 b | 309 | 75 | 22 | Moderately fast rate of filtration, but somewhat thicker than 3 hw, smooth | General laboratory filtration; essential oils; emulsions; essences; vinegar; extracts; yeasts; salt solutions; spirits; tinctures; water |
| 41 b | 462 | 75 | 22 | Filtration properties as for 4 b, but manufactured as cellulose folded filters for use in breweries | All-purpose filter papers; primarily recommended for malt and beer analysis or for degassing according to EBC standards in brewery laboratories |
| 603 | 334 | 75 | 8 | Medium-fast rate of filtration, thin, creped | Fast and easy clarification before less critical analysis of highly viscous liquids |
| 603/N | 335 | 75 | 8 | Medium-fast rate of filtration as for 603, thin, but higher wet strength, creped | Sugar juices; sugar solutions; clarifying filtration of clarified dried sugar beet shred and of beet sugar extracts |
| 6 | 312 | 80 | 15 | Faster rate of filtration and thicker than grade 41 b, high wet strength | All-purpose filter papers; also recommended for malt and beer analysis or degassing like grade 41 b; also suitable for coarser or gelatinous precipitates; for clarification of dried sugar beet shreds in sugar factories; essences; spirits |
| 131 | 351 | 80 | 100 | Slow rate of filtration, dense, low content of phosphate and potassium | Soil analysis according to Egnér, Riehm and Lederle to determine the phosphate or potassium content using calcium lactate elutions |
| 132 | 329 | 80 | 55 | Faster rate of filtration than grade 131, medium density, low content of phosphate and potassium | Soil analyses as for grade 131; for rapid retention of relatively coarse precipitates |
| 480 | 602 | 85 | N/A | Moderately fast rate of filtration, smooth, impregnated with a stabilized silicon to render it hydrophobic | Separation of aqueous and non-aqueous phases; e.g., organic solutions that are lighter or heavier than water, such as extraction liquids in chemical or clinical laboratories |

* Filters Sorted According to Basis Weight

** Filtration rate in seconds: see page 37

| Grade | Serial no. | g/m ² | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|---------|---|--|
| 5 H/N | 423 | 85 | 3 | The fastest rate of filtration of all grades of filter papers, soft, extra wide-pored, creped, wet strength | Alginates; essential oils; extracts; agar-agar |
| 100/N | 328 | 85 | 30 | Moderately fast rate of filtration and medium thick, low content of potassium and sodium, increased wet strength, smooth | Especially suitable for assaying saccharose, potassium and sodium in sugar beets or cane sugar according to the aluminum sulfate method for the VENEMA system |
| 17 | 319 | 90 | 7 | Fast rate of filtration as with grade 10, with an increased filtration area due to creped structure | Extracts; tinctures; body fluids; salty solutions with relatively high viscosity |
| 17/N | 321 | 90 | 20 | Moderately fast rate of filtration, same basis weight as grade 17, but denser and thicker, increased wet strength, creped | Filtration of must, juices, wine and exceptionally viscous liquids |
| 22/NS | 358 | 90 | 10 | Medium-fast rate of filtration, increased wet strength as C 251, but thinner and creped | Clarification of galvanic baths |
| 460/N | 332 | 90 | 50 | Slow to moderately fast rate of filtration, increased wet strength | Tannin solutions; potash (potassium carbonate); acids; cloudy protein solutions; galvanic baths; vacuum or pressure filtration |
| 10 | 352 | 120 | 7 | Fast rate of filtration, thick, wide-pored | Juices; spirits; essences; used for marking dyes in the textile industry |
| 37/N | 480 | 135 | 4 | Rate of filtration same as for 39/N, but thinner and creped; soft, extra wide-pored | Anthracites; dye emulsions; Canada balsam; gum arabic; paint or lacquer solutions; resins and pigments; exceptionally viscous solutions; agar-agar; collodion; gelatin |
| 470 | 606 | 140 | 80 | Slow rate of filtration, made of cellulose and diatomaceous earth, thick, smooth | Filtration of the finest, semi-colloidal precipitates, e.g., those consisting of proteins or clay or cold-precipitated barium sulfate; milk serum; fertilizer extracts; standard grade for clarification of urine or sugar solutions; not suitable for lightening colored solutions for which activated carbon paper can be used |
| C 140 | 356 | 140 | 70 | Moderately fast rate of filtration, thick paper, retention of coarse particles and increased wet strength | Rapid filtration of relatively coarse precipitates |
| 6 S/N | 314 | 145 | 12 | Medium-fast rate of filtration, extra thick, creped, high wet burst resistance | Filtration of gelatin, resin solutions; specified for testing the germination capability of seeds in rolled paper strips ("Vienna roll method" for relatively large seeds) |
| 69 K | 326 | 155 | 65 | Slow rate of filtration, black, analytical-grade activated carbon paper, narrow-pored, dense | Clarification and lightening of cloudy liquids, e.g., turbid, dark urine before polarimetric glucose assay; detection of fine traces of white precipitates and mycelia of molds; determination of impurities in gases; determination of the antiseptic effect of wood impregnating agents |
| 39/N | 483 | 180 | 4 | Rate of filtration same as for grade 37/N, but extra thick and with higher wet burst resistance; soft, extra wide-pored, creped | For rapid removal of highly coarse impurities by vacuum or pressure filtration; for highly viscous solutions, such as syrup, fruit juices, emulsions |
| 3 S/h | 307 | 200 | 55 | Slow to moderately fast rate of filtration, thick, narrow-pored; retains fine particles; smooth | Ideal for difficult-to-clarify liquids, such as oils, tinctures, essences; particularly suitable for use as flat disc filters in Buechner funnels |

* Filtration rate in seconds: see page 37

Liquid Absorption Using Filter Papers and Boards*

| Grade | Serial no. | g/m ² | Fv (s)** | Capillary rise*** mm/10 min. | Properties | Preferable application areas |
|--------|------------|------------------|----------|---------------------------------|--|--|
| 64 | 403 | 100 | | 80 | Highly absorbent, pure cotton linter paper of a highly homogeneous structure | Raw paper for the manufacture of pH indicator and special test papers |
| 50 S | 353 | 120 | 30 | 100 | Relatively thick paper, absorbent, increased wet strength | Ideal for use as germination test paper for testing sugar beet seeds according to NEEB; pre-pleated strips to fit in a plastic cup |
| 51 S | 366 | 120 | 30 | 100 | Relatively thick paper, absorbent, increased wet strength | Ideal for use as germination test paper according to NEEB; gray colored for easier identification of white seeds; available pre-pleated |
| 64 a | 405 | 135 | | 80 | Like 64, but thicker | The same application as for 64 |
| A 140 | 411 | 140 | | 35 | Thin board, absorbent | Suitable as absorptive material for the paper and printing industries |
| 601/PE | 601 | 140 | | | Polyethylene-coated on one side, highly absorbent, impermeable | For protection of laboratory surfaces from aggressive substances; for preventing contamination in radiochemical laboratories; ideal for lining experimental animal cages; for recovery of spillage of expensive substances when the PE side faces upward; for reduction of the risk of glass breakage on hard lab surfaces |
| SB 2 | 350 | 155 | | 20 | Moderately fast rate of filtration | Mineral oils; relatively large volumes of liquids; used as absorptive material in special formats |
| C 160 | 343 | 160 | 40 | | Slow to moderately fast rate of filtration, thin board, increased wet strength | For filtration of slightly acidic and alkaline solutions; galvanic baths; cooking and transformer oils; used as absorptive material for bench cyto-centrifuges |
| S 165 | 417 | 165 | | 80 | Absorbent | Absorption and surface protection |
| A 250 | 412 | 250 | | 75 | Medium thick board with medium absorbency | Relatively high volumes of easy-to-clarify liquids; determination of the water absorptiveness according to COBB (EN 20535) as used in the pulp and paper industries |
| C 250 | 344 | 250 | 40 | | Slow to moderately fast rate of filtration and increased wet strength; like C 160, but thicker | Cooking and transformer oils; galvanic baths |
| C 251 | 355 | 250 | 8 | | Fast rate of filtration, increased wet strength | Clarification of galvanic baths |

* Sorted According to Basis Weight

** Filtration rate in seconds: see page 37

*** Capillary rise in mm/10 min or mm/30 min acc. to KLEMM and DIN ISO 8787: see page 37

| Grade | Serial no. | g/m ² | Fv (s)* | Capillary rise** mm/10 min. | Properties | Preferable application areas |
|--------|------------|------------------|---------|-----------------------------|---|---|
| M 270 | 415 | 270 | | 105 | Highly absorbent, bulky, impregnated against fungal growth in the presence of water | Absorption of water to increase humidity in rooms |
| C 300 | 345 | 300 | 40 | | Slow to moderately fast rate of filtration and increased wet strength, medium thick | Clarification of galvanic baths |
| C 350 | 346 | 350 | 40 | | Slow to moderately fast rate of filtration and increased wet strength, thick board | Clarification of galvanic baths; carbon hydroxides; oils; special cuts; for use as absorptive material for bench cyto-centrifuges |
| LF 1 | 413 | 360 | | | Thick, bulky | Removal of dust from air in nuclear power plants |
| C 450 | 347 | 450 | 40 | | Slow to moderately fast rate of filtration and increased wet strength | Used as absorptive material in special formats for bench cyto-centrifuges; filtration of boiler water |
| S 500 | 421 | 500 | >40 | | Absorbent, gray | Absorption and protection of surfaces |
| 431 ZY | 431 | 500 | | 95 | Slow to moderately fast rate of filtration, exceptional wet strength, extra thick board | Used as absorptive material in special formats for bench cyto-centrifuges; filtration of boiler water |
| M 600 | 416 | 600 | | | Highly absorbent, very bulky, extra thick | For use in filter presses, e.g., as disc filters; also with a center hole |

* Filtration rate in seconds: see page 37

** Capillary rise in mm/10 min or mm/30 min acc. to KLEMM and DIN ISO 8787: see page 37

Separation of Aqueous and Organic Phases using Grade 480 Phase Separator Papers



This high-quality, special paper separates aqueous from organic phases. Grade 480 is impregnated with a stabilized silicon, thus rendering it hydrophobic. It retains water and allows solvents to flow through. In many applications, this phase separator paper eliminates the need to use separating funnels.

A unique benefit of using phase separator papers is that no special skills are required to achieve a clean separation. Flow ceases automatically once the entire solvent has passed through the filter paper. Phase separator paper is particularly useful when you need to carry out several separation runs.

Ordering Information

| Diameter | Quantity per pkg. | Order no. for filter discs | Order no. for folded filters |
|----------|-------------------|----------------------------|------------------------------|
| 70 mm | 100 sheets | FT-3-602-070 | FT-4-602-070 |
| 90 mm | 100 sheets | FT-3-602-090 | FT-4-602-090 |
| 110 mm | 100 sheets | FT-3-602-110 | FT-4-602-110 |
| 125 mm | 100 sheets | FT-3-602-125 | FT-4-602-125 |
| 150 mm | 100 sheets | FT-3-602-150 | FT-4-602-150 |
| 185 mm | 100 sheets | FT-3-602-185 | FT-4-602-185 |
| 240 mm | 100 sheets | FT-3-602-240 | FT-4-602-240 |
| 270 mm | 100 sheets | FT-3-602-270 | FT-4-602-270 |

Other diameters and sheet sizes are available on request.

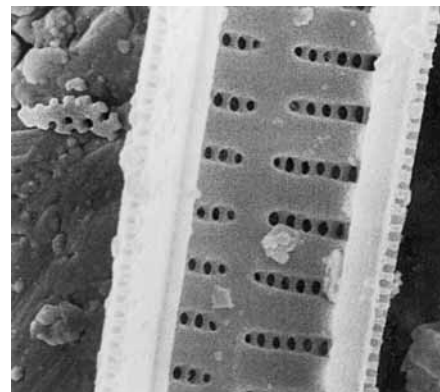
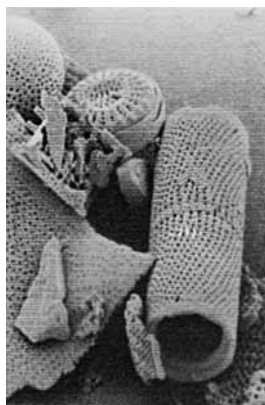
| Grade | Serial no. | g/m ² | Fv (s)* | Properties | Preferable application areas |
|-------|------------|------------------|---------|---|---|
| 480 | 602 | 85 | N/A | Moderately fast rate of filtration, thin, smooth, impregnated with silicon and therefore water-retentive, hydrophobic | Organic solvents (e.g., ether, petrolether) that are lighter or heavier than water (e.g., chloroform); filtration of extraction solvents in clinical or medical laboratories; decomposition of emulsions that are formed during the extraction of aqueous plant or drug solutions |

* Filtration rate in seconds: see page 37

Rapid Filtration of the Finest Precipitates using Grade 470 Diatomaceous Earth Filter Papers

Diatomaceous earth is obtained by open-cast mining of the exceptionally tiny siliceous skeletons of diatoms. These are dried to remove any residual moisture and heated red-hot to remove all organic residues. Then the skeletons are ground to a particulate size between one and ten micrometers to make fine diatomaceous earth grades. The grinding process simply breaks apart the skeletons, while the very fine pores of the skeleton structure that are smaller than 0.5 μm remain intact. This porous structure is what constitutes the desired filtration effect. The refined diatomaceous earth, or kieselguhr, product is mixed with cellulose pulp in a ratio of approx. 1:10.

Our filter papers made of cellulose and diatomaceous earth have a much better separating capability than pure cellulose papers at the same rate of filtration. Grade 470 quickly retains the finest particles at high flow rates.



Siliceous skeletons of diatomaceous algae (diatoms) and their microporous structure magnified under the microscope

Ordering Information

| Diameter | Quantity per pkg. | Order no. for filter discs | Order no. for folded filters |
|----------|-------------------|----------------------------|------------------------------|
| 090 | 100 | FT-3-606-090 | |
| 110 | 100 | FT-3-606-110 | FT-4-606-110 |
| 125 | 100 | FT-3-606-125 | FT-4-606-125 |
| 150 | 100 | FT-3-606-150 | FT-4-606-150 |
| 185 | 100 | FT-3-606-185 | FT-4-606-185 |
| 240 | 100 | FT-3-606-240 | FT-4-606-240 |
| 270 | 100 | FT-3-606-270 | FT-4-606-270 |
| 320 | 100 | FT-3-606-320 | FT-4-606-320 |
| 385 | 100 | FT-3-606-385 | FT-4-606-385 |
| 400 | 100 | FT-3-606-400 | FT-4-606-400 |
| 450 | 100 | FT-3-606-450 | FT-4-606-450 |
| 500 | 100 | FT-3-606-500 | FT-4-606-500 |

Other diameters and sheet sizes are available on request.

| Grade | Serial no. | g/m^2 | Fv (s)* | Properties | Preferable application areas |
|-------|------------|----------------|---------|--|--|
| 470 | 606 | 140 | 80 | Slow rate of filtration, made of cellulose and diatomaceous earth, thick, smooth | Filtration of the finest, semi-colloidal precipitates, e.g., those consisting of proteins or clay or cold-precipitated barium sulfate; milk serum; fertilizer extracts; standard grade for clarification of urine or sugar solutions for spectrophotometry or refractometry; not suitable for lightening colored solutions for which activated carbon paper (grade 69 K) can be used |

* Filtration rate in seconds: see page 37

Surface Protection using Polyethylene-Coated Papers

601/PE is a highly absorptive paper coated on one side with polyethylene that can be used in a wide range of applications.

Typical Applications

In radiochemical laboratories, 601/PE absorbs spilled reagents and prevents radioactive contamination of work surfaces.

601/PE is suitable for recovering spilled solutions containing valuable reagents.

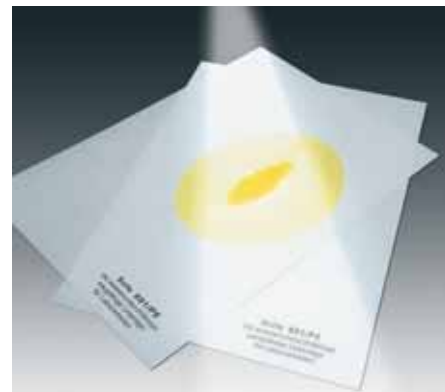
601/PE is an impermeable protective paper, ideal for lining experimental animal cages.

601/PE helps reduce the risk of glass breakage on hard or tiled surfaces, etc.

601/PE protects laboratory surfaces.

The paper side quickly absorbs liquids and the polyethylene prevents them from seeping through to the working surface.

Basis weight: 140 g/m²



Ordering Information for Standard Sizes

| Size | Order no. |
|---------------|----------------------------------|
| Rolls | 400 mm × 50 m FT-1-601-400050 |
| | 400 mm × 100 m FT-1-601-400100 |
| | 600 mm × 50 m FT-1-601-600050 |
| | 600 mm × 100 m FT-1-601-600100 |
| Sheets | 480 mm × 600 mm FT-2-601-480600K |

Other sizes are available on request.

| Grade | Serial no. | g/m ² | Water absorption (g/m ²) | Properties | Preferable application areas |
|--------|------------|------------------|--------------------------------------|---|--|
| 601/PE | 601 | 140 | 280 | Polyethylene coated on one side, highly absorbent impermeable | Used to protect surfaces and benchtops in the laboratory against aggressive reagents and chemicals, to prevent contamination in radiochemical laboratories. Is the ideal lining for experimental animal cages. Can be used to recover valuable reagents after spillage. When used with the PE side up, reduces the risk of glass breakage on hard surfaces and benchtops in the laboratory |

Newborn Screening using Grade TFN Sample Carrier Papers

Grade TFN sample carrier material is made from high-purity cotton linter pulp. This guarantees that no test results are falsified. The TFN properties that are indispensable for their intended use are subject to constant quality controls. For the production of test cards, TFN paper can be printed with the texts required by the individual Countries.

Typical Applications

TFN is used to absorb and transport human bodily fluids (usually capillary blood, but also urine or saliva) that are to be screened for hereditary diseases and metabolic disorders such as phenylketonuria (using the Guthrie test, also called the heel prick test) and congenital hypothyroidism (using the TSH test).

Guthrie Test Cards

Sartorius supplies the test cards for required the blood tests. The print and quality of the individual Guthrie test cards comply with the specific regulations of each of the German Federal states.

Area of Use

Guthrie test (phenylalanine screening)

Properties

- Highly absorbent
- Evenly absorbent over the entire test card
- No impurities or thin spots
- High purity, no leachable components



| Grade | Serial no. | g/m ² | Thickness* (mm) | Capillary rise** mm/10 min. | Properties | Preferable application areas |
|-------|------------|------------------|-----------------|-----------------------------|---|---|
| TFN | 460 | 180 | 0.44 | 120 | Highly absorbent, high-purity paper; evenly absorbent over the entire test card, approved by the NCCLS*** | For the absorption and transport human bodily fluids (usually capillary blood, but also urine or saliva) for subsequent neonatal screening to detect hereditary diseases and metabolic disorders such as phenylketonuria (using the Guthrie test, also called the heel prick test) and congenital hypothyroidism (using the TSH test) |

Technical Test Data

| | |
|----------------------------|----------------------|
| Basis weight: | 180 g/m ² |
| Thickness*: | 0.44 mm |
| Blood drop, mean diameter: | 16 mm/100 µl |
| Mean serum volume | 1.30 µl/3 mm hole |

These data are typical test results. They do not represent product specifications of any kind.

Ordering Information

| Dimensions | Quantity per pkg. | Order number |
|-----------------------------------|-------------------|------------------|
| 460 × 570 mm unprinted paper | 100 | FT-2-460-460570N |
| 210 × 297 mm (A4) unprinted paper | 100 | FT-2-460-210297N |

* Thickness according to DIN EN ISO20534: see page 37

** National Committee for Clinical Laboratory Standards, Villanova, Pa. U.S.A., document LA4-A3 1997

*** Capillary rise in mm/10 min or mm/30 min according to the KLEMM method and DIN ISO 8787: see page 37

Fragrance Test Cards

Benefit from our 120 years of experience in manufacturing paper that preserves the genuine fragrance!

We supply fragrance test cards in any pre-fabricated shape or size, either plain or printed with company logos etc.

In addition to our standard grade C 160, all other paper qualities from our assortment are also suitable for this purpose.

Advantages of Sartorius fragrance test cards:

- You can preserve the fragrance-specific properties of your product because our papers are manufactured exclusively with high-purity raw materials;
- The fragrance is released immediately after wetting and lasts a long time because Sartorius fragrance test cards possess an extremely high absorptive capacity;
- Provides you with an effective advertising medium. We can design the shape, size and logo to be printed to your specifications;
- You can write the name of the perfume or aerosol or specification for documentation purposes directly on the fragrance test card.



We will be happy to provide you with further information and or free samples on request.

| Grade | Serial no. | Properties | Preferable application areas |
|--------------|-------------------|---|---|
| C 160 | 343 | Natural white paper with a rough surface, printable | For absorption of aerosols or perfumes and for comparing different fragrances in perfume laboratories perfume shops, drug stores, for the customers in-shop and to take home. Printable with the company stamp and logo |

Indicator and Test Papers for Reagents

Unitest pH Paper

For easy and fast pH determination with an accuracy sufficient for nearly all routine pH tests

- Available within narrow pH ranges of 1–5, 5–9 and 9–13.
- Available within the complete pH range of either of 1–11 or 1–14
- Rolls: 10 mm × 5 m in length, individually packaged in plastic dispensers



| Description | pH range | Quantity per pkg. | Order number |
|-------------|----------|-------------------|---------------|
| Unitest I | 1–11 | 1 roll | FT-6-603-0111 |
| Unitest II | 1– 5 | 1 roll | FT-6-603-0105 |
| Unitest III | 5– 9 | 1 roll | FT-6-603-0509 |
| Unitest IV | 9–13 | 1 roll | FT-6-603-0913 |
| Unitest V | 1–14 | 1 roll | FT-6-603-0114 |

Stuphan Indicator Strips

For accurate determination of the pH in water samples and for adjusting the pH of a sample during analysis.

- Significantly superior to other pH papers when it is important to prevent analytical errors during the testing of highly buffered solutions

- Weakly buffered solutions can be tested by immersing the strips in them until the final color of the reaction is attained
- The indicator dyes do not contaminate the sample to be tested so it can be used for further analyses
- Supplied in standard packages of 250 test strips in different 10 types and dimensions (10 × 74 mm)



| Description | pH range | Quantity per pkg. | Order number |
|----------------|----------|-------------------|---------------|
| Stuphan no. 1 | 0.4–1.4 | 250 strips | FT-2-603-0001 |
| Stuphan no. 2 | 1.2–2.7 | 250 strips | FT-2-603-0102 |
| Stuphan no. 3 | 2.7–4.2 | 250 strips | FT-2-603-0204 |
| Stuphan no. 4 | 3.9–5.4 | 250 strips | FT-2-603-0305 |
| Stuphan No. 5 | 5.1–6.6 | 250 strips | FT-2-603-0506 |
| Stuphan No. 6 | 6.0–7.5 | 250 strips | FT-2-603-0607 |
| Stuphan No. 7 | 7.5–8.7 | 250 strips | FT-2-603-0708 |
| Stuphan No. 8 | 8.1–9.6 | 250 strips | FT-2-603-0809 |
| Stuphan No. 9 | 6.6–8.1 | 250 strips | FT-2-603-0608 |
| Stuphan No. 10 | 9.5–10.7 | 250 strips | FT-2-603-0910 |

Biophan G and E

For determining the concentration of glucose or protein in urine

| Description | Quantity per pkg. | Order number |
|-------------|-------------------|---------------|
| Biophan G | 10 strips | FT-2-603-9997 |
| Biophan E | 10 strips | FT-2-603-9998 |

Litmus Papers

For identification of acids and bases

- Blue litmus paper: The color changes from blue to red to indicate a shift from basic to acidic
- Neutral litmus paper: The color changes from purple to red (acidic) or blue (basic)

- Red litmus paper: The color changes red to blue to indicate a shift from basic to acidic

| Description | Quantity per pkg. | Order number |
|------------------------|-------------------|---------------|
| Litmus paper (blue) | 1 roll | FT-6-603-9991 |
| Litmus paper (neutral) | 1 roll | FT-6-603-9992 |
| Litmus paper (red) | 1 roll | FT-6-603-9993 |

Potassium Iodide Starch Paper

For the detection of nitrite and for testing the final product for diazotization (diazo paper)

- Color changes from gray to dark purple
- Rolls: 10 mm × 5 m in length, packaged separately in plastic dispenser

- Generally suitable for detecting organic substances that release iodine

| Description | Quantity per pkg. | Order number |
|-------------------------------|-------------------|---------------|
| Potassium iodide starch paper | 1 roll | FT-6-603-9994 |

Lead Acetate Paper

For the detection of sulfur containing compounds

- Sulfur is present if the paper turns black or brown if the concentration is low

- Rolls: 10 mm × 5 m in length, packaged separately in plastic dispenser

| Description | Quantity per pkg. | Order number |
|--------------------|-------------------|---------------|
| Lead acetate paper | 1 roll | FT-6-603-9995 |

Phosphate Test Paper

For the detection of alkaline phosphatase in milk.

- When about one-third of the strip including the sheath is dipped into milk, the paper turns yellow after a few seconds if the milk contains alkaline phosphatase.

- When raw, i.e. non-pasteurized milk or pasteurized milk is used as a control, the sample will turn yellow if the milk was not heated sufficiently. If the color does not change, this is positive proof that the milk was subjected to short-term heating.

- Supplied in packages of 10 test strips

| Description | Quantity per pkg. | Order number |
|----------------------|-------------------|---------------|
| Phosphate test paper | 10 strips | FT-6-603-9996 |

Base Paper for Coating with Reagents

| Grade | Serial no. | g/m ² | Capillary rise* mm/10 min. | Properties | Preferable application areas |
|-------|------------|------------------|----------------------------|---|--|
| 64 | 403 | 100 | 80 | Highly absorbent, pure cotton linter paper with superior uniformity | Base paper for the production of pH indicator paper or special reagent paper |
| 64 a | 405 | 135 | 80 | Same as 64, but thicker | Same as grade 64 |

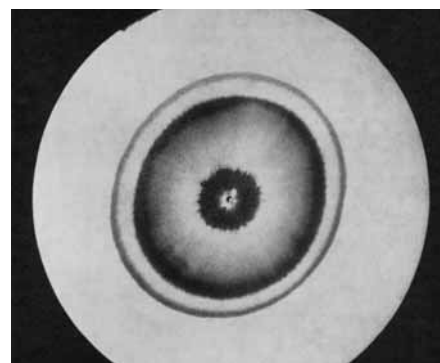
* Capillary rise in mm/10 min or mm/30 min according to the KLEMM method and DIN ISO 8787: see page 37

Chromatography paper for routine and repetitive separations

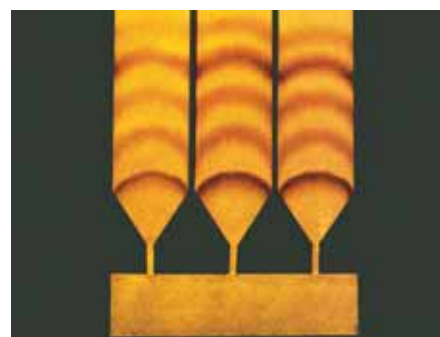
One of the fundamental methods employed in paper chromatography and paper electrophoresis is to use paper for separating compounds out of mixtures. Although separation in paper chromatography is essentially based on the principle of partition chromatography, additional adsorption and ion exchange processes may also take place. That is why these methods are almost exclusively limited to the separation and assaying of low-molecular-weight compounds, such as amino acids, sugars, fatty acids, steroid hormones, pigments, etc. By contrast, the separation of proteins by paper chromatography does not produce satisfactory results because the proteins undergo strong adsorption and denaturation. Paper chromatography mainly involves the distribution of substances to be separated between the stationary phase (with paper as the carrier and water) and the mobile phase (developing solvent).

The substances to be separated migrate at different rates – a property determined by their different distribution coefficients, molecule sizes (molecular weights) and electronic charges.

The choice of developing solvent is important to prevent adsorption, while the paper quality (manufacturing and storing conditions) can minimize exchange processes that would otherwise interfere with the separation process. The careful selection of raw materials used in Sartorius chromatography papers and our exceptional expertise in their manufacture are guarantees that no exchange processes will take place with the substance to be separated when the Sartorius "FN" product family is used.



Chromatographic separation of inorganic cations (circular technique) on paper strips grade FN 6



Chromatographic separation of amino acids on paper strips grade FN 4

| Grade | Serial no. | g/m ² | Thickness* mm | Capillary rise** mm/30 min. | Properties Applications |
|-------|------------|------------------|---------------|-----------------------------|---|
| FN 1 | 501 | 90 | 0.20 | 145 | Lusterless surface, fastest running of papers, thin, analytical paper for routine and repetitive chromatographic separations and lower loadings, some loss in resolution must be accepted |
| FN 2 | 502 | 120 | 0.25 | 145 | As fast running as grade FN 1, but thicker and for heavier loadings, with a smooth surface |
| FN 3 | 503 | 90 | 0.19 | 93 | Soft surface, moderately fast running standard paper for routine analysis of proteins in serum (e.g. human albumin) |
| FN 4 | 504 | 120 | 0.24 | 93 | Same capillary rise as FN 3, but with a smoother surface, for heavier loadings because thicker |
| FN 5 | 505 | 90 | 0.17 | 60 | The slowest running analytical chromatography paper with the highest resolution, for circular and horizontal techniques, soft surface |
| FN 6 | 506 | 120 | 0.22 | 60 | Runs as slowly as grade FN 5 with maximum resolution, but is thicker and therefore preferable for heavier loadings, smooth surface |

* Thickness in mm according to DIN EN ISO 20537: see page 37

** Capillary rise in mm/10 min or mm/30 min according to the KLEMM method and DIN ISO 8787: see page 37

| Grade | Serial no. | g/m ² | Thickness* mm | Capillary rise** mm/30 min. | Properties Applications |
|--------|------------|------------------|---------------|-----------------------------|--|
| FN 7 | 507 | 150 | 0.32 | 145 | Fast running, soft surface, for less critical analytical work when some loss in resolution is acceptable; suitable for heavier loadings or semi-preparative purposes |
| FN 7a | 508 | 200 | 0.32 | 145 | Same flow rate and thickness as grade FN 7 but higher basis weight for heavier loadings, analytical and semi-preparative purposes |
| FN 8 | 509 | 280 | 0.55 | 170 | Very fast running, soft surface for separation of larger molecules with electrophoresis and for preparative purposes |
| FN 30 | 526 | 390 | 0.90 | 235 | Fastest running and thickest chromatography paper, for preparative purposes with very high loadings |
| FN 100 | 527 | 195 | 0.35 | 130 | Medium thickness, fast running, ideal combination of a chromatography and gel blotting paper. Widely used for gel wicking and drying, capillary blotting using Western, Southern or semidry techniques; available as sheets, strips, or on small reels of various widths and lengths |

Grades FN 1 to FN 8 as well as FN 30 and FN 100 have a lower ash content***.

This can help prevent background interference from trace inorganic impurities (e.g. cations) that paper can contain in order to quantify these elements in the substance after chromatography.

* Thickness in mm according to DIN EN ISO 20537: see page 37

** Capillary rise in mm/10 min or mm/30 min according to the KLEMM method and DIN ISO 8787: see page 37

*** Ash content [0.02% according to DIN 54370], see page 37

Identification of Individual Components in Nucleic Acid or Protein Specimens using Gel Blotting Papers

Sartorius supplies four grades of blotting papers. Their extremely smooth surface and relatively high thickness provide them with absorption properties and most superior uniformity across the entire contact area in the blotting transfer system (see picture).

The blotting papers are made from the purest naturally occurring raw materials with the maximum degree of absorptiveness and α cellulose contents.

Their functions include:

- Absorption and improvement of the transport of transfer buffer after capillary and semidry blotting

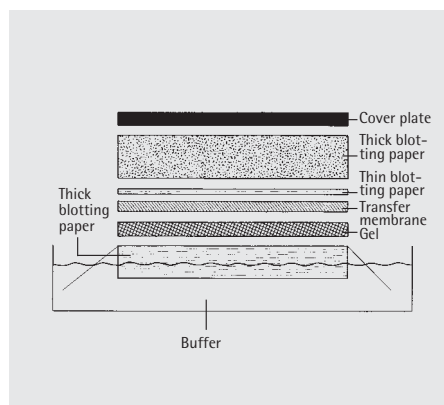
- Double-sided cover of gel and transfer membrane in the blotting tank after conventional electroblotting

- To prevent direct contact between blotting membrane and porous cover plate of the vacuum chamber for dot | slot blotting of DNA/RNA.

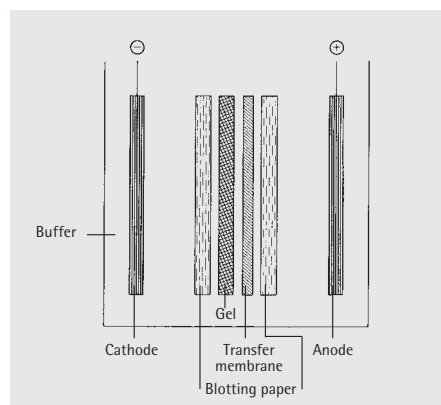
| Grade | Serial no. | g/m ² | Thickness* mm | Capillary rise** mm/30 min. | Properties Applications |
|--------|------------|------------------|---------------|-----------------------------|---|
| BF 1 | 518 | 90 | 0.16 | 80 | Thinnest grade of all blotting papers, moderately fast absorbing, used to cover the gel-membrane sandwich in the buffer tank (conventional electro-transfer method) |
| BF 2 | 519 | 190 | 0.36 | 70 | Thicker and slightly slower absorbing, BF 2 can be used to cover the gel membrane sandwich in the buffer tank as BF 1, but also as a protective layer for the membrane placed on a porous plate for the vacuum or dot/slot blotting processes |
| BF 3 | 520 | 330 | 0.76 | 130 | Twice as thick as BF 2, high absorption rate and capability, preferably used to increase and maintain the transport of liquid from the buffer and as buffer reservoir according to the capillary and semidry blotting methods |
| BF 4 | 521 | 550 | 1.3 | 160 | Thickest and fastest absorbing blotting paper in the range with the highest absorptiveness, preferably used when few paper layers must provide high buffering capacity. The reduction in the number of layers also helps to minimize the risk of air bubbles in a blotting sandwich pack. Used to transfer DNA or RNA according to the Southern technique or semidry blotting of proteins |
| FN 100 | 527 | 195 | 0.35 | 130 | Medium thickness, fast running, ideal combination of chromatography and gel blotting paper. Same thickness as grade BF 2, same speed and absorption capability as BF 3; the ideal general-purpose blotting paper for Southern, Northern and Western blotting, gel lifting, sequencing, buffer wicking and semidry blotting; available as sheets, strips and small rolls in varying widths and lengths |

* Thickness in mm according to DIN EN ISO 20537: see page 37

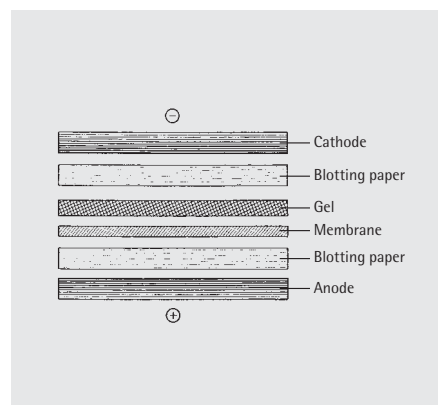
** Capillary rise in mm/10 min or mm/30 min according to the KLEMM method and DIN ISO 8787: see page 37



Capillary blotting sandwich



Electroblotting sandwich according to Towbin ("buffer tank")



Semidry Electroblotting sandwich according to Kyhse-Andersen

Quantification of Individual Components in Foods, Plastic Materials, Pesticides, Dust or Air using Extraction Thimbles

Sartorius extraction thimbles are renowned for their purity and consistently high quality. The standard grades are manufactured from cotton liners with a high alpha-cellulose content which makes them high-purity thimbles that possess mechanical strength and outstanding retention capacity.

We supply two different thimble designs:

1. With a defined outer diameter × outer length, flat bottom, grade 35 (cellulose)
2. With a defined inner diameter × outer length, round bottom, wall thickness accord. to DIN 12449, grade 30 (cellulose), 40 (glass microfiber), T293 (quartz microfiber)

Both thimble designs fit perfectly into their size-matched extractors.

The outer diameter is used to calculate the right size for flat bottom thimbles, which is directly proportional to the extractor size.

To calculate the outer diameter of round bottom thimbles, double the inner diameter and the wall thickness both have to be considered.

The external diameter of a thimble should always be at least 2 mm (up to a maximum of 4 mm) smaller than the extractor diameter.

The catalogue sizes indicate the inner diameter for all grade 30 cellulose round bottom thimbles (order numbers "FT-1201-... ..") and the outer diameter for all grade 35, cellulose flat bottom thimbles (order numbers "FT-1210-... ..").

The table below lists flat bottom thimbles in the same line as their respective round bottom thimble to allow easy conversion between the two designs. This way it is always possible to replace a round bottom with a flat bottom thimble. The last six digits of each reference number show the thimble dimension (inner or outer diameter × outer length) in mm.

| Inner diameter (mm) | Tolerance (mm) | Thimble height (mm) | Tolerance (mm) | Wall thickness (mm) | Outer diameter of | Fits extractors according to DIN 12602 and 12604 with a nominal volume of (ml) |
|---------------------|----------------|---------------------|----------------|---------------------|-------------------|--|
| 22 | +0 -3 | 80 | +10 -0 | 1.5 | 25 | 30 |
| 33 | +0 -3 | 94 | +10 -0 | 1.5 | 36 | 100 |
| 33 | +0 -3 | 205 | +10 -0 | 1.5 | 36 | 250 |
| 48 | +0 -5 | 230 | +20 -0 | 2.0 | 52 | 500 |
| 57 | +0 -5 | 315 | +20 -0 | 2.5 | 62 | 1000 |

| Grade | Serial no. | Material | Properties | Preferable application areas |
|-------|------------|-------------------|---|---|
| 30 | 1201 | Cellulose | Inner diameter × outer length according to DIN 12449, Round bottom | All routine fat extractions, e.g. fat, components in foodstuff (sweets, frozen cakes, pastries, margarine or baking ingredients), extraction of lipids from eggs and egg-containing products, softeners, additives, monomer components in plastics and rubber |
| 35 | 1210 | Cellulose | Outer diameter × outer length, flat bottom, standard retention capacity, thermally stable up to approx. 100°C | Same as grade 30 |
| 40 | 1204 | Glass microfiber | Good retention capacity (penetration DOP <0.002%–0.3 µm), thermally stable up to 500°C | Separation of minutest particulate matter from dust, aerosols, gas or air streams |
| 50 | 1207 | Quartz microfiber | Good retention capacity (penetration DOP <0.002%–0.3 µm), thermally stable to and acidic gases, trace element analysis 900–950 °C max., low concentration of trace impurities (see table below) | Emission immission testing at high temperatures, also for the analysis of hot |

Typical trace element values in grade T293 quartz thimbles (µg/g)

| | | | | | | | | |
|-----|-----|-----|-------|-------|-----|-----|----|----|
| Al | Ba | Ca | Cd | Co | Cr | Cu | Fe | Mg |
| 300 | 10 | 250 | 0.002 | < 0.5 | 2 | 2 | 50 | 25 |
| Mn | Na | Ni | Pb | Sr | Ti | V | Zn | |
| 2 | 100 | 2 | < 1 | 3 | < 1 | < 5 | 6 | |

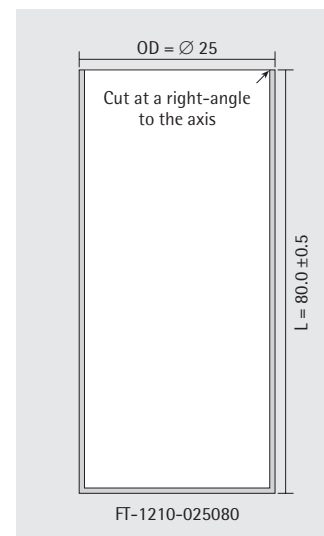
Ordering Information

| Outer diameter × outer length (mm) Flat bottom | Quantity per pkg. | Order number | Inner diameter × outer length (mm) Round bottom | Quantity per pkg. | Order number |
|--|----------------------|----------------|---|----------------------|----------------|
| Cellulose, Grade 35 | | | Cellulose, Grade 30 | | |
| | | | 9 × 50 | 25 | FT-1201-009050 |
| 20 × 90 | 25 | FT-1210-020090 | | | |
| 22 × 70 | 25 | FT-1210-022070 | | | |
| 22 × 80 | 25 | FT-1210-022080 | 20 × 80 | 25 | FT-1201-020080 |
| 22 × 100 | 25 | FT-1210-022100 | | | |
| 25 × 60 | 25 | FT-1210-025060 | | | |
| 25 × 80 | 25 | FT-1210-025080 | 22 × 80 | 25 | FT-1201-022080 |
| 25 × 90 | 25 | FT-1210-025090 | 23 × 90 | 25 | FT-1201-023090 |
| 25 × 100 | 25 | FT-1210-025100 | 23 × 100 | 25 | FT-1201-023100 |
| | | | 27 × 60 | 25 | FT-1201-027060 |
| 30 × 80 | 25 | FT-1210-030080 | 27 × 80 | 25 | FT-1201-027080 |
| | | | 28 × 80 | 25 | FT-1201-028080 |
| 30 × 90 | 25 | FT-1210-030090 | | | |
| 30 × 100 | 25 | FT-1210-030100 | 28 × 100 | 25 | FT-1201-028100 |
| 30 × 120 | 25 | FT-1210-030120 | 28 × 120 | 25 | FT-1201-028120 |
| 33 × 80 | 25 | FT-1210-033080 | 30 × 80 | 25 | FT-1201-030080 |
| | | | 33 × 80 | 25 | FT-1201-033080 |
| 33 × 94 | 25 | FT-1210-033094 | 33 × 94 | 25 | FT-1201-033094 |
| 33 × 95 | 25 | FT-1210-033095 | | | |
| 33 × 100 | 25 | FT-1210-033100 | 30 × 100 | 25 | FT-1201-030100 |
| | | | 33 × 100 | 25 | FT-1201-033100 |
| 33 × 118 | 25 | FT-1210-033118 | 33 × 118 | 25 | FT-1201-033118 |
| 33 × 145 | 25 | FT-1210-033145 | | | |
| 33 × 150 | 25 | FT-1210-033150 | | | |
| | | | 33 × 205 | 25 | FT-1201-033205 |
| 37 × 90 | 25 | FT-1210-037090 | | | |
| 37 × 95 | 25 | FT-1210-037095 | | | |
| 37 × 100 | 25 | FT-1210-037100 | | | |
| 37 × 210 | 25 | FT-1210-037210 | | | |
| 43 × 123 | 25 | FT-1210-043123 | 43 × 123 | 25 | FT-1201-043123 |
| 43 × 150 | 25 | FT-1210-043150 | 40 × 150 | 25 | FT-1201-040150 |
| 48 × 145 | 25 | FT-1210-048145 | | | |
| 48 × 200 | 25 | FT-1210-048200 | | | |
| 53 × 145 | 25 | FT-1210-053145 | | | |
| 57 × 280 | 25 | FT-1210-057280 | | | |
| 60 × 120 | 25 | FT-1210-060120 | | | |
| 60 × 180 | | FT-1210-060180 | 60 × 180 | 25 | FT-1201-060180 |
| 60 × 275 | | FT-1210-060275 | | | |
| 70 × 200 | | FT-1210-070200 | | | |
| 70 × 250 | | FT-1210-070250 | | | |

Conversion example: Outer diameter of a grade 35 thimble = inner diameter of a grade 30 thimble + 2 × wall thickness

$$OD(\text{grade 35}) = ID(\text{grade 30}) + 2s$$

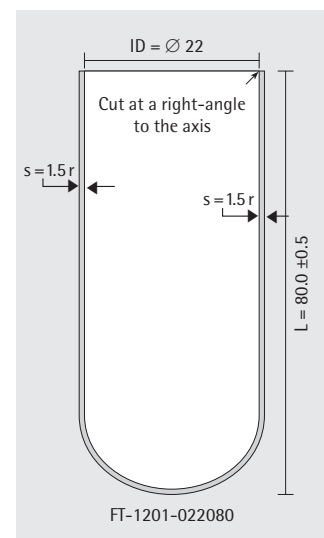
OD +0 mm/-3...5 mm, See table on page 31



Dimensions of a grade 35 extraction thimble

OD = Outer diameter in mm

L = Length in mm



Dimensions of a grade 30 extraction thimble

ID = Inner diameter in mm

L = Length in mm

s = Wall thickness in mm

Ordering Information

| Inner diameter × outer length (mm) Round bottom | Quantity per pkg. | Order number |
|--|-------------------|----------------|
| Glass Microfiber, grade 40 | | |
| 10×50 | 25 | FT-1204-010050 |
| 19×90 | 25 | FT-1204-019090 |
| 22×80 | 25 | FT-1204-022080 |
| 25×50 | 25 | FT-1204-025050 |
| 26×60 | 25 | FT-1204-026060 |
| 30×80 | 25 | FT-1204-030080 |
| 30×100 | 25 | FT-1204-030100 |
| 30×110 | 25 | FT-1204-030110 |
| 33×80 | 25 | FT-1204-033080 |
| 33×94 | 25 | FT-1204-033094 |
| 33×150 | 25 | FT-1204-033150 |
| 40×150 | 25 | FT-1204-040150 |
| 43×123 | 25 | FT-1204-043123 |
| 53×145 | 25 | FT-1204-053145 |
| Quartz Microfiber, grade T293 | | |
| 22×62 | 25 | FT-1207-022062 |
| 25×90 | 25 | FT-1207-025090 |
| 25×100 | 25 | FT-1207-025100 |
| 26×60 | 25 | FT-1207-026060 |
| 30×77 | 25 | FT-1207-030077 |
| 34×150 | 25 | FT-1207-034150 |
| 35×150 | 25 | FT-1207-035150 |
| 43×123 | 25 | FT-1207-043123 |

Soxhlet attachment
incl. round bottom flask,
extractor with thimble,
reflux condenser
(Dimroth cooler) heating
mantle, current regulator
Source: Phywe Systeme
GmbH



Flat and round bottom
extraction thimbles
(Grades 35 and 30)

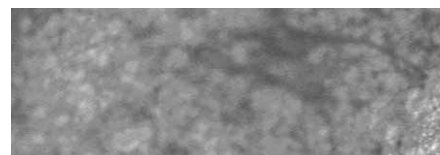
Rapid Filtration of Relatively Fine Precipitates for Further Quantitative or Qualitative Analyses using MG Glass Microfiber Filters

Glass Microfiber Filters

- Manufactured from 100% borosilicate glass, are highly pure and extremely white;
- Combine fast flow rates with high load capacity and the retention of very fine particles extending into the sub-micron range;
- Completely binder free;
- Withstand temperatures up to 500°C
- Biologically inert, non-hygroscopic, resistant to most reagents and solvents, except for highly concentrated acids and bases.



Loose glass microfibers under a microscope



Glass microfiber filter matrix under a microscope

Applications

General Laboratory Filtration

- Clarification of buffer and reagent solutions, especially in techniques involving spectrophotometry (MGA)
- Filtration of eluent and samples for HPLC (MGF)
- Removal of finely suspended carbonaceous material from test liquids (MGA, MGF)
- Carbohydrate analysis where cellulose fibers would interfere after hydrolysis (MGC)
- Filtration of electrolyte used for particle size analysis (MGF)
- Removal of precipitates in ion-pair reagents (MGA)
- Gravimetric analysis of fillers and pigments (MGF)

- Clarification of protein solutions prior to freeze-drying (MGC, MGF)
- Determination of sediment in petroleum products (MGA)
- Quantification of oil and fat content in food by dripping solvent onto samples supported on the filter (MGA)

Biochemical Precipitates and Cells

- Collection of macromolecular precipitates (DNA, RNA, proteins, polysaccharides), especially for end-group analysis, followed by scintillation counting on the filter (MGC)
- Cell harvesting, for example during inclusion studies (MGC)
- Collection of membrane fragments in receptor binding assays (MGC)

Process Control

- Assessment of cleanliness of machined parts by washing in hydrocarbon solvent, filtering and viewing stain on filter (MGA)
- Control testing for industrial filters; downstream samples are filtered through a 150 mm glass microfiber disc which is examined for particulate (MGA)

| Grade | Serial no. | g/m ² | Air resistance 40 cm/s (10 cm ²) mbar | Thickness mm/ 10 min* | Particle retention µm | Preferable application areas |
|-------|------------|------------------|---|-----------------------------|--------------------------|---|
| MGA | 1101 | 55 | 33 | 0.25 | 1.6 | High-efficiency, general laboratory filtration; also suitable for air pollution monitoring in compliance with many international standards |
| MGB | 1102 | 140 | 95 | 0.70 | 1.0 | Filtration of suspensions in water, wastewater analysis, can be used as pre-filters to protect membranes, general filtration of larger volumes of liquid |
| MGC | 1103 | 52 | 54 | 0.26 | 1.2 | Analysis of suspended solids in wastewater, water clarification and monitoring purpose pre-filter for membranes |
| MGD | 1104 | 120 | 16 | 0.53 | 2.7 | All-purpose membrane prefilter |
| MGF | 1105 | 75 | 120 | 0.45 | 0.7 | Better retention of smaller particles than other glass microfiber filters, e.g. clarification of protein solutions and filtration of samples and solvents before HPLC |

* Thickness in mm acc. to DIN EN ISO20534, see page 37

Ordering Information

| Grade | Diameter (mm) | Quantity per pkg. | Order number | Grade | Diameter (mm) | Quantity per pkg. | Order number |
|--------------|----------------------|--------------------------|---------------------|--------------|----------------------|--------------------------|---------------------|
| MGA | 25 | 100 | FT-3-1101-025 | MGD | 25 | 50 | FT-3-1104-025 |
| MGA | 47 | 100 | FT-3-1101-047 | MGD | 47 | 50 | FT-3-1104-047 |
| MGA | 50 | 100 | FT-3-1101-050 | MGD | 50 | 50 | FT-3-1104-050 |
| MGA | 55 | 100 | FT-3-1101-055 | MGD | 55 | 50 | FT-3-1104-055 |
| MGA | 70 | 100 | FT-3-1101-070 | MGD | 70 | 50 | FT-3-1104-070 |
| MGA | 90 | 100 | FT-3-1101-090 | MGD | 90 | 50 | FT-3-1104-090 |
| MGA | 100 | 100 | FT-3-1101-100 | MGD | 100 | 50 | FT-3-1104-100 |
| MGA | 110 | 100 | FT-3-1101-110 | MGD | 110 | 50 | FT-3-1104-110 |
| MGA | 125 | 100 | FT-3-1101-125 | MGD | 125 | 50 | FT-3-1104-125 |
| MGA | 150 | 100 | FT-3-1101-150 | MGD | 150 | 50 | FT-3-1104-150 |
| MGA | 185 | 100 | FT-3-1101-185 | MGD | 185 | 50 | FT-3-1104-185 |
| MGA | 240 | 50 | FT-3-1101-240 | MGD | 240 | 25 | FT-3-1104-240 |
| MGB | 25 | 50 | FT-3-1102-025 | MGF | 25 | 100 | FT-3-1105-025 |
| MGB | 47 | 50 | FT-3-1102-047 | MGF | 47 | 100 | FT-3-1105-047 |
| MGB | 50 | 50 | FT-3-1102-050 | MGF | 50 | 100 | FT-3-1105-050 |
| MGB | 55 | 50 | FT-3-1102-055 | MGF | 55 | 100 | FT-3-1105-055 |
| MGB | 70 | 50 | FT-3-1102-070 | MGF | 70 | 100 | FT-3-1105-070 |
| MGB | 90 | 50 | FT-3-1102-090 | MGF | 90 | 100 | FT-3-1105-090 |
| MGB | 100 | 50 | FT-3-1102-100 | MGF | 100 | 100 | FT-3-1105-100 |
| MGB | 110 | 50 | FT-3-1102-110 | MGF | 110 | 100 | FT-3-1105-110 |
| MGB | 125 | 50 | FT-3-1102-125 | MGF | 125 | 100 | FT-3-1105-125 |
| MGB | 150 | 50 | FT-3-1102-150 | MGF | 150 | 100 | FT-3-1105-150 |
| MGB | 185 | 50 | FT-3-1102-185 | MGF | 185 | 100 | FT-3-1105-185 |
| MGB | 240 | 25 | FT-3-1102-240 | MGF | 240 | 50 | FT-3-1105-240 |
| MGC | 25 | 100 | FT-3-1103-025 | | | | |
| MGC | 47 | 100 | FT-3-1103-047 | | | | |
| MGC | 50 | 100 | FT-3-1103-050 | | | | |
| MGC | 55 | 100 | FT-3-1103-055 | | | | |
| MGC | 70 | 100 | FT-3-1103-070 | | | | |
| MGC | 90 | 100 | FT-3-1103-090 | | | | |
| MGC | 100 | 100 | FT-3-1103-100 | | | | |
| MGC | 110 | 100 | FT-3-1103-110 | | | | |
| MGC | 125 | 100 | FT-3-1103-125 | | | | |
| MGC | 150 | 100 | FT-3-1103-150 | | | | |
| MGC | 185 | 100 | FT-3-1103-185 | | | | |
| MGC | 240 | 50 | FT-3-1103-240 | | | | |

Monitoring Trace Levels at High Temperatures using T293 Quartz Microfiber Filters

Quartz microfiber filters are free of glass fibers and binding agents. They are especially suited for emission monitoring at temperatures of up to 950°C and wherever filters of the highest purity are needed. Grade T293 is distinguished by a minimum level of trace impurities (see table below) and excellent weight and dimensional stability.

| Grade | Grade no. | g/m ² | Air resistance 40 cm/s (10 cm ²) mbar | Retention (%) 0.3 mm | Penetration DOP (%) 0.3 µm | Preferable application areas |
|-------|-----------|------------------|---|----------------------------|----------------------------------|--|
| T293 | 1109 | 85 | 51.5 | 99.999 | < 0.002 | Monitoring trace levels of pollutants in air, removal of trace organic impurities and to ensure minimal loss upon further heating, sampling (max. 950°C) of stacks, flue outlets and aerosols (emission/immission monitoring) at both ambient and high temperatures, sampling in the presence of acid gases (except HF) is also possible |

Typical trace element values in grade T293 quartz (ppm)

| | | | | | | | | |
|-----|------|-----|-----|-----|-----|-----|-----|----|
| Al | Ba | Ca | Cd | Co | Cr | Cu | Fe | K |
| 110 | <100 | 100 | <1 | <5 | <10 | 5,2 | 50 | 10 |
| Mg | Mn | Na | Ni | Pb | Sr | Ti | V | Zn |
| 20 | <10 | 90 | <10 | <10 | - | - | <10 | 11 |

Ordering Information

| Grade | Diameter (mm) | Quantity per pkg. | Order number |
|-------|---------------|-------------------|---------------|
| T293 | 25 | 25 | FT-3-1109-025 |
| T293 | 37 | 25 | FT-3-1109-037 |
| T293 | 47 | 25 | FT-3-1109-047 |
| T293 | 50 | 25 | FT-3-1109-050 |
| T293 | 55 | 25 | FT-3-1109-055 |
| T293 | 70 | 25 | FT-3-1109-070 |
| T293 | 90 | 25 | FT-3-1109-090 |
| T293 | 95 | 25 | FT-3-1109-095 |
| T293 | 100 | 25 | FT-3-1109-100 |
| T293 | 110 | 25 | FT-3-1109-110 |
| T293 | 120 | 25 | FT-3-1109-120 |
| T293 | 125 | 25 | FT-3-1109-125 |
| T293 | 150 | 25 | FT-3-1109-150 |
| T293 | 185 | 25 | FT-3-1109-185 |
| T293 | 240 | 25 | FT-3-1109-240 |

Application Charts

| Medium | Grade | Pages |
|----------------------------|---|--------------------------------|
| Absorption of liquids | 3w, 4b, 6, 601/PE, S165, S500 | 14, 15, 17, 18, 21 |
| Acids | 3m/N, 460/N, 488/N | 15, 16 |
| Agar-agar | 5H/N, 39/N | 16 |
| Air cleaning | LF 1 | 18 |
| Alcohols | 6S/N, 3m/N, 3S/h, 6, SB | 13, 14, 15, 16, 17 |
| Alginates | 5H/N, 39/N | 16 |
| Alkaline solutions | 460/N, 488/N | 15, 16 |
| Anthracene | 37/N, 39/N | 16 |
| Beer analysis | 41b, 6, 292, 470 | 9, 11, 12, 13, 15, 16, 20 |
| Beer wort | 6, 17 | 11, 14, 15, 16 |
| Beet juice | 288, 3w, 4b | 9, 15 |
| Berry juice | 39/N, 37/N, 6S/N | 12, 13, 14, 16 |
| Birch sap | SB 2, 388 | 8, 17 |
| Blood sugar, determination | 3hw, 4b | 13, 15 |
| Boric acid solution | 3hw, 3w | 13, 15 |
| Cacao butter | 17/N, C 160 | 16, 17, 23 |
| Canada balsam | 3w, 39/N | 12, 15, 16 |
| Coffee | FT 55 | 15 |
| Colloidal solutions | 5H/N, 37/N, 6S/N, 39/N | 12, 13, 14, 16 |
| Condiments | 3h | 15 |
| Culture media | 37/N, 39/N | 12, 16 |
| Diesel oil | SB 2 | 17 |
| Dye solutions | 3S/h, 6S/N, 10, 37/N, 39/N | 12, 13, 14, 15, 16 |
| Eau de cologne | 3w, 4b, 6, 6S/N | 11, 13, 14, 15, 16 |
| Emulsions | 288, 4b, 5H/N, 6S/N, 6, 37/N, 39/N | 9, 11, 12, 13, 14, 15, 16 |
| Essences | 3hw, 3w, 4b, 6, 10 | 11, 13, 14, 15, 16 |
| Essential oils | 288, 3hw, 4b, 6, 6S/N, 37/N, 39/N | 9, 11, 12, 13, 14, 15, 16 |
| Extract solutions | 6 S/N, 4b, 6, 17, 488/N, C 160, 37/N, 39/N | 11, 12, 13, 14, 15, 16, 17, 23 |
| Fat content quantification | 389 F, MGA, 30, 35 | 8, 29, 30, 32, 33 |
| Filter presses, board | C 160, C 250, C 300 | 17, 18, 23 |
| Filter presses, paper | 17/N, 603/N | 15, 16 |
| Fruit juices | 5H/N, 6, 6S/N, 10, 37/N, 39/N | 11, 12, 13, 14, 15, 16 |
| Fuel | SB 2 | 17 |
| Galvanic baths | 460/N, 603, C 350, C 251, 22/NS | 15, 16, 17, 18 |
| Gelatinous precipitates | 5H/N, 6S/N, 10, 37/N, 39/N | 12, 13, 14, 16 |
| Gelatin | 5H/N, 6S/N, 39/N | 12, 13, 14, 16 |
| Germinating test | 3m/N, 6, 6S/N, 10, C 250, 50S, 51 S, 601/PE, 37/N, 39/N | 11, 12, 13, 14, 15, 16, 17, 21 |
| Glycerin | 5H/N, 6S/N, 37/N, 39/N | 12, 13, 14, 16 |
| Greases, technical | 603 | 15 |
| Gum arabic | 6, 37/N, 39/N | 11, 12, 14, 15, 16 |
| Hair tonic | 3w, 6, 6S/N, 37/N, 39/N, 10 | 11, 12, 13, 14, 15, 16 |
| Herb extracts | 3m/N, 6S/N, 4b, 6, 10 | 11, 13, 14, 15, 16 |
| Herbal extracts | 3m/N, 3S/h, 4b, 6, 10 | 11, 14, 15, 16 |
| Hydrocarbons | C 350, C 450 | 18 |
| Indicator raw papers | 64, 64a | 17, 25 |
| Injections, solutions | 1291, 460/N, 488/N | 10, 15, 16 |

| Medium | Grade | Pages |
|-----------------------------|--|---------------------------------------|
| Juices | 3S/h, 5H/N, 6S/N, 17/N, 37/N, 39/N | 12, 13, 14, 16 |
| Lacquers | 3S/h, 5H/N, 6S/N, 17, 10, 39/N | 12, 13, 14, 16 |
| Lining of cupboards etc. | 3m/N, 3h, 4b, 6 | 11, 14, 15 |
| Liqueurs | 5H/N, 6S/N, 37/N, 39/N | 12, 13, 14, 16 |
| Liquid extracts | 3m/N, 4b, 6, 6S/N | 11, 13, 14, 15, 16 |
| Malt analysis | 41b, 6, 292, 470 | 9, 11, 12, 13, 14, 15, 16, 20 |
| Mashes | 41b, 6, 292, 470 | 9, 11, 12, 13, 14, 15, 16, 20 |
| Mineral oils | 3 S/h, 6, C 350, SB 2, C 251, MGA | 11, 14, 15, 16, 17, 18, 32, 33 |
| Mucilaginous substances | 5H/N, 6S/N, 17, 17/N, MGA, MGC, 37/N, 39/N | 12, 13, 14, 16, 32, 33 |
| Must | 288, 6, 6S/N, 17/N | 9, 11, 13, 14, 15, 16 |
| Oils | C 350, C 450, MGA, 39/N | 12, 16, 18, 32, 33 |
| Pepsin wine | 6S/N, 6, 10, SB 2 | 11, 13, 14, 15, 16, 17 |
| Perfumes | 6S/N, 3w, 4b, C 160, SB 2 | 13, 14, 15, 16, 17, 18, 23 |
| Plant extracts | 3S/h, 4b, 6, C 160 | 11, 14, 15, 16, 17, 23 |
| Plastic flongs | M 600 | 18 |
| Polarimetry | 69 K | 16 |
| Potash | 3m/N, 460/N | 15, 16 |
| Pressure filtration | 460/N, 488/N | 15, 16 |
| Protein turbidities | 460/N, 488/N, MGC, MGF | 15, 16, 32, 33 |
| Rennet | 3m/N, 39/N | 12, 15, 16 |
| Resin milk | 3S/h, 5H/N, 6S/N, C 350, 39/N | 12, 13, 14, 16, 18 |
| Rubber, dissolved | 6S/N, 37/N, 39/N | 12, 13, 14, 16 |
| Rum | 6S/N, 3w, 4b, 6, 10, C 160 | 11, 13, 14, 15, 16, 17, 23 |
| Salad oils | 603, C 160, 17/N | 15, 16, 17, 23 |
| Salt solutions | 3hw, 4b, 17, 100/N, 1602/N | 13, 15, 16 |
| Seed germs, drying of | 4b, 6, 601/PE, 50 S, 51 S, 6 S/N | 11, 13, 14, 15, 16, 17, 21 |
| Sera | 3h, 4b | 15 |
| Soap | 3m/N, C 160, SB 2 | 15, 17, 23 |
| Soil tests | 131, 132 | 15 |
| Spirits | 3hw, 4b, 6, 100/N, 10, SB 2 | 11, 13, 14, 15, 16, 17 |
| Sugar juices | 3hw, 6, 6S/N, MGC, 100/N, 37/N, 39/N | 11, 12, 13, 14, 15, 16, 32, 33 |
| Syrup | 5H/N, 6S/N, 37/N, 39/N | 12, 13, 14, 16 |
| Tanning agents, solution of | 1291, 460/N, 488/N | 10, 15, 16 |
| Tar oils | 6, 17/N, 30, 35 | 11, 14, 15, 16, 29, 30 |
| Tar, fine filtration of | 17/N | 16 |
| Tea | 1602/N | 15 |
| Technical oils | 288, 6, 17/N, C 160, C 350, C 450, 22/NS, MGA | 9, 11, 14, 15, 16, 17, 18, 23, 32, 33 |
| Tinctures | 3hw, 3m/N, 3w, 3S/h, 4b, 6, 17, 100/N | 11, 13, 14, 15, 16 |
| Transformer oils | 6, 488/N, C 160, C 250, C 251, C 300, C 450, MGA | 11, 14, 15, 16, 17, 32, 33 |
| Turbine oils | 6, C 250, C 251, C 300 | 11, 14, 15, 17, 18 |
| Tylose | 5H/N, 6S/N, 37/N, 39/N | 12, 13, 14, 16, 17 |
| Urine | 69 K, Biophan E, Biophan G | 16, 24 |
| Vacuum filtration | 3m/N, 460/N, 488/N | 15, 16 |
| Vinegar | 4b, 6 | 11, 14, 15 |
| Viscous solutions | 5H/N, 6S/N, 37/N, 39/N | 12, 13, 14, 16 |
| Water | 3w, 4b, 6, MGC | 11, 14, 15, 32, 33 |
| Wines | 293, 470 | 9, 11, 12, 13, 16, 20 |
| Yeast | 3w, 4b, 6 | 11, 14, 15 |

Quality Assurance and Control

Sartorius pays particular attention to ongoing in-process quality controls. Regular tests and accurate analyses of raw materials and of each end product additionally guarantee consistently high quality and product uniformity.

Basis Weight According to DIN EN ISO 536

The basis weight as defined by DIN EN ISO 536 is determined by weighing a paper sheet that is 100×100 mm or has a diameter of 113 mm on a special paper balance. The balance is calibrated and shows weight per square meter with an error limit of ±0.5%.

Expressed in grams per square meter.

Thickness According to DIN EN ISO 20534

The paper strength or thickness is measured using thickness meter or gauge readings.

Expressed in millimeters.

Tensile Strength According to DIN EN ISO 1924-2

A continually increasing load is applied vertically to a paper strip 15 mm × 180 mm. The tensile strength is defined as the stretching force necessary to break the piece. Usually measured by placing a standard test piece in a tensile machine.

Expressed in kilograms-force per 15 millimeter width (kgf/15 mm) or kN/m.

Bursting Strength According to DIN ISO 2758

A test specimen is held between two circular clamps and subjected to an increasing pressure from a rubber diaphragm. The rubber diaphragm is expanded by a controlled hydraulic pressure until the test specimen ruptures. The bursting strength of the specimen is the pressure reading at the time of rupture. This term is referred to in this catalogue as "burst strength."

Expressed in kilopascal (kPa)

Filtration Rate

The time required to filter 10 ml of distilled water at 20°C through a free-hanging, fully-wetted disc filter with a diameter of 110 mm folded in quarters.

Expressed in seconds (per mm)

Air Resistance

Air resistance is the pressure drop that occurs after filtration of a defined air stream (270 l/h, 10 m²) through a filter paper

Expressed in mbar.

Capillary Rise According to DIN ISO 8787

When measured according to the Klemm method, the capillary rise defined as height to which a 15 x 250 mm paper strip, whose narrow side is immersed in prefiltered distilled water (20° C), is wetted after 10 or 30 min.

Stated in mm pro 10 min and 30 min.

Ash Content According to DIN 54370

The ash content is the residue determined after ignition of 10 g of filter paper at 900°C in a platinum crucible.

Expressed in percent.

Separation Capacity

The tested capacity of a filter paper to retain precipitates of ferric hydroxide, lead sulfate, barium sulfate and calcium oxalate.

Nomenclature of Order Numbers for Filter Papers

FT-●-●●●●-●●●●●●●●

FT = Filter Paper

Filter Paper Type:

(One digit)

- 1 = Rolls
- 2 = Sheets
- 3 = Discs
- 4 = Folded
- 6 = pH paper

Not applicable for extraction thimbles

Filter Paper Serial no.:

(Three to four digits)

- 1__ Ashless papers
- 2__ Qualitative papers
- 3__, 4__, 6__ Qualitative and technical, indicator and reagent papers
- 5__ Chromatography and blotting papers
- 11__, 12__ Thimbles and glass/quartz microfibre flat filters

Filter Paper Format:

(Three to seven digits)

- Sheets:** Length × Width (mm × mm)
- Discs:** Diameter (mm)
- Folded:** Diameter (mm)
- Rolls:** Width × Length (mm × m)
- Thimbles:** Diameter × Length (mm × mm)

Examples:

Order No. = FT-1-601-400050

FT-1 = Filter Paper Roll
601 = Serial no. (Conversion from grade 601/PE to serial no. 601)
400050 = Width 400 mm × Length 50 m

Order No. = FT-4-101-090

FT-4 = Folded Filter,
101 = Serial no. (Conversion from grade 388 to serial no. 101)
090 = Diameter 90 mm

Order No. = FT-2-334-580580

FT-2 = Filter Paper Sheet
334 = Serial no. (Conversion from grade 603 to serial no. 334)
580580 = Length 580 mm × Width 580 mm

Order No. = FT-1210-030100

FT-Serial no. = Extraction Thimbles
1210 = Serial no. (Conversion from grade 35 to serial no. 1210)
030100 = Outer diameter 30 mm × Inner diameter 100 mm

Order No. = FT-3-101-125

FT-3 = Disc Filter,
101 = Serial no. (Conversion from grade 388 to serial no. 101)
125 = Diameter 125 mm

Index of Grades, Sorted According to Product Groups

Ashless Filter Papers for Quantitative Analysis

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|-------|---------------|
| ● 388 | 84 | 8 | 101 |
| ○ 389 | 84 | 8 | 102 |
| ● 389F | 84 | 8 | 112 |
| ● 390 | 84 | 8 | 103 |
| ● 391 | 84 | 8 | 104 |
| ● 392 | 84 | 8 | 105 |
| ● 393 | 100 | 8 | 127 |

Analytical Filter Papers for Qualitative Analysis

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|-------|---------------|
| 288 | 80 | 9 | 201 |
| 289 | 80 | 9, 11 | 202 |
| 290 | 80 | 9 | 203 |
| 291 | 80 | 9 | 204 |
| 292 | 87 | 9, 11 | 205 |
| 292 a | 97 | 9 | 215 |
| 293 | 80 | 9, 12 | 211 |
| 1288 | 84 | 10 | 206 |
| 1289 | 84 | 10 | 207 |
| 1290 | 84 | 10 | 208 |
| 1291 | 84 | 10 | 209 |
| 1292 | 84 | 10 | 210 |

Qualitative and Technical Filter Papers – Sorted According to Basis Weight

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|--------------------|---------------|
| FT 55 | 55 | 15 | 348 |
| 3 h | 65 | 15 | 302 |
| 3 hw | 65 | 13, 15 | 303 |
| 3 m/N | 65 | 15 | 305 |
| 3 w | 65 | 15 | 308 |
| 488/N | 65 | 15 | 333 |
| 601/N | 65 | 13, 15 | 354 |
| 1602/N | 70 | 15 | 342 |
| 4 b | 75 | 15 | 309 |
| 41 b | 75 | 11, 15 | 462 |
| 603 | 75 | 15 | 334 |
| 603/N | 75 | 15 | 335 |
| 6 | 80 | 11, 14, 15 | 312 |
| 131 | 80 | 15 | 351 |
| 132 | 80 | 15 | 329 |
| 480 | 85 | 15, 19 | 602 |
| 5 H/N | 85 | 16 | 423 |
| 100/N | 85 | 13, 16 | 328 |
| 17 | 90 | 16 | 319 |
| 17/N | 90 | 16 | 321 |
| 22/NS | 90 | 16 | 339 |
| 460/N | 90 | 16 | 332 |
| 10 | 120 | 16 | 352 |
| 37/N | 135 | 12, 16 | 480 |
| 470 | 140 | 11, 12, 13, 16, 20 | 606 |
| C 140 | 140 | 16 | 356 |
| 6 S/N | 145 | 13, 14, 16 | 314 |
| 69 K | 155 | 16 | 326 |
| 39/N | 175 | 12, 16 | 483 |
| 3 S/h | 200 | 16 | 307 |

Absorptive Filter Papers and Boards – Sorted According to Basis Weight

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|------------|---------------|
| 64 | 100 | 17, 25 | 403 |
| 50 S | 120 | 14, 17 | 353 |
| 51 S | 120 | 14, 17 | 366 |
| 64 a | 135 | 17, 25 | 405 |
| A 140 | 140 | 17 | 411 |
| 601/PE | 140 | 14, 17, 21 | 601 |
| SB 2 | 155 | 17 | 350 |
| C 160 | 160 | 17, 23 | 343 |
| S 165 | 165 | 17 | 417 |
| TFN | 180 | 22 | 460 |
| A 250 | 250 | 17 | 412 |
| C 250 | 250 | 17 | 344 |
| C 251 | 250 | 17 | 355 |
| M 270 | 270 | 18 | 415 |
| C 300 | 300 | 18 | 345 |
| C 350 | 350 | 18 | 346 |
| LF 1 | 360 | 18 | 413 |
| C 450 | 450 | 18 | 347 |
| S 500 | 500 | 18 | 421 |
| 431 ZY | 500 | 18 | 431 |
| M 600 | 600 | 18 | 416 |

Indicator and reagent papers

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------------------------------|----------------------------------|--------|---------------|
| 64 | 100 | 17, 25 | 403 |
| 64 a | 135 | 17, 25 | 405 |
| Biophan strips (glucose protein) | | 24 | 603 |
| Lead acetate paper | | 25 | 603 |
| Litmus paper | | 25 | 603 |
| Phosphate test paper | | 25 | 603 |
| Potassium iodide starch paper | | 25 | 603 |
| Stuphan test strips | | 24 | 603 |
| Unitest | | 24 | 603 |

Chromatography and Gel Blotting Papers

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|--------|---------------|
| FN 1 | 90 | 26 | 501 |
| FN 2 | 120 | 26 | 502 |
| FN 3 | 90 | 26 | 503 |
| FN 4 | 120 | 26 | 504 |
| FN 5 | 90 | 26 | 505 |
| FN 6 | 120 | 26 | 506 |
| FN 7 | 150 | 27 | 507 |
| FN 7a | 200 | 27 | 508 |
| FN 8 | 280 | 27 | 509 |
| FN 30 | 390 | 27 | 526 |
| FN 100 | 195 | 27, 28 | 527 |

Gel Blotting Papers

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|--------|---------------|
| BF 1 | 90 | 28 | 518 |
| BF 2 | 190 | 28 | 519 |
| BF 3 | 330 | 28 | 520 |
| BF 4 | 550 | 28 | 521 |
| FN100 | 195 | 27, 28 | 527 |

Extraction Thimbles

| Grade name | Bottom | Pages | Serial number |
|--------------------------|--------|--------|---------------|
| 30 (Cellulose) | Round | 29, 30 | 1201 |
| 35 (Cellulose) | Flat | 29, 30 | 1210 |
| 40 (Glass microfiber) | Round | 29, 31 | 1204 |
| T293 (Quartz microfiber) | Round | 29, 31 | 1207 |

Glass Microfiber Filters

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|--------|---------------|
| MGA | 55 | 32, 33 | 1101 |
| MGB | 140 | 32, 33 | 1102 |
| MGC | 52 | 32, 33 | 1103 |
| MGD | 120 | 32, 33 | 1104 |
| MGF | 75 | 32, 33 | 1105 |

Quartz Microfiber Filters

| Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|-------|---------------|
| T293 | 85 | 34 | 1109 |

Index of Grades, Alphanumerically Sorted According to Grade Name

| Grade name | Basis weight (g/m ²) | Pages | Serial number | Grade name | Basis weight (g/m ²) | Pages | Serial number | Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|--------------------|---------------|------------|----------------------------------|------------|---------------|-------------------------------|----------------------------------|------------|---------------|
| 4 b | 75 | 15 | 309 | 3 h | 65 | 15 | 302 | FN 1 | 90 | 26 | 501 |
| 6 | 80 | 11, 14, 15 | 312 | 3 hw | 65 | 13, 15 | 303 | FN 100 | 195 | 27, 28 | 527 |
| 10 | 120 | 16 | 352 | 3 m/N | 65 | 15 | 305 | FN 2 | 120 | 26 | 502 |
| 17 | 90 | 16 | 319 | 3 S/h | 200 | 16 | 307 | FN 3 | 90 | 26 | 503 |
| 30 | | 29, 30 | 1201 | 3 w | 65 | 15 | 308 | FN 30 | 390 | 27 | 526 |
| 35 | | 29, 30 | 1210 | ● 389 F | 84 | 8 | 112 | FN 4 | 120 | 26 | 504 |
| 40 | | 29, 31 | 1204 | 41 b | 75 | 11, 15 | 462 | FN 5 | 90 | 26 | 505 |
| 131 | 80 | 15 | 351 | 460/N | 90 | 16 | 332 | FN 6 | 120 | 26 | 506 |
| 132 | 80 | 15 | 329 | 488/N | 65 | 15 | 333 | FN 7 | 150 | 27 | 507 |
| 288 | 80 | 9 | 201 | 5 H/N | 85 | 16 | 423 | FN 7a | 200 | 27 | 508 |
| 289 | 80 | 9, 11 | 202 | 50 S | 120 | 14, 17 | 353 | FN 8 | 280 | 27 | 509 |
| 290 | 80 | 9 | 203 | 51 S | 120 | 14, 17 | 366 | FT 55 | 55 | 15 | 348 |
| 291 | 80 | 9 | 204 | 37/N | 135 | 16 | 315 | MGA | 55 | 32, 33 | 1101 |
| 292 | 87 | 9, 11 | 205 | 6 S/N | 145 | 13, 14, 16 | 314 | MGB | 140 | 32, 33 | 1102 |
| 293 | 80 | 9, 12 | 211 | 39/N | 175 | 12, 16 | 313 | MGC | 52 | 32, 33 | 1103 |
| ● 388 | 84 | 8 | 101 | 601/N | 65 | 13, 15 | 354 | MGD | 120 | 32, 33 | 1104 |
| ○ 389 | 84 | 8 | 102 | 603/N | 75 | 15 | 335 | MGF | 75 | 32, 33 | 1105 |
| ● 390 | 84 | 8 | 103 | 64 | 100 | 17, 25 | 403 | Potassium iodide starch paper | | 25 | 603 |
| ● 391 | 84 | 8 | 104 | 64 a | 135 | 17, 25 | 405 | Litmus paper | | 25 | 603 |
| ● 392 | 84 | 8 | 105 | 69 K | 155 | 16 | 326 | LF 1 | 360 | 18 | 413 |
| ● 393 | 100 | 8 | 127 | A 140 | 140 | 17 | 411 | M 270 | 270 | 18 | 415 |
| 470 | 140 | 11, 12, 13, 16, 20 | 606 | A 250 | 250 | 17 | 412 | M 600 | 600 | 18 | 416 |
| 480 | 85 | 15, 19 | 602 | BF 1 | 90 | 28 | 518 | 601/PE | 140 | 14, 17, 21 | 601 |
| 603 | 75 | 15 | 334 | BF 2 | 190 | 28 | 519 | Phosphate test paper | | 25 | 603 |
| 1288 | 84 | 10 | 206 | BF 3 | 330 | 28 | 520 | T293 | 85 | 34 | 1109 |
| 1289 | 84 | 10 | 207 | BF 4 | 550 | 28 | 521 | T293 (thimbles) | | 29, 31 | 1207 |
| 1290 | 84 | 10 | 208 | Biophan | | 24 | 603 | S 165 | 165 | 17 | 417 |
| 1291 | 84 | 10 | 209 | C 140 | 140 | 16 | 356 | S 500 | 500 | 18 | 421 |
| 1292 | 84 | 10 | 210 | C 160 | 160 | 17, 23 | 343 | SB 2 | 155 | 17 | 350 |
| 100/N | 85 | 13, 16 | 328 | C 250 | 250 | 17 | 344 | Stuphan | | 24 | 603 |
| 1602/N | 70 | 15 | 342 | C 251 | 250 | 17 | 355 | TFN | 180 | 22 | 460 |
| 17/N | 90 | 16 | 321 | C 300 | 300 | 18 | 345 | Unitest | | 24 | 603 |
| 22/NS | 90 | 16 | 339 | C 350 | 350 | 18 | 346 | 431 ZY | 500 | 18 | 431 |
| 292 a | 97 | 9 | 215 | C 450 | 450 | 18 | 347 | | | | |

Index of Grades, Numerically Sorted According to Serial Number

| Grade name | Basis weight (g/m ²) | Pages | Serial number | Grade name | Basis weight (g/m ²) | Pages | Serial number | Grade name | Basis weight (g/m ²) | Pages | Serial number |
|------------|----------------------------------|------------|---------------|------------|----------------------------------|--------|---------------|-------------------------------|----------------------------------|--------------------|---------------|
| ● 388 | 84 | 8 | 101 | 22/NS | 90 | 16 | 339 | BF 1 | 90 | 28 | 518 |
| ○ 389 | 84 | 8 | 102 | 1602/N | 70 | 15 | 342 | BF 2 | 190 | 28 | 519 |
| ● 390 | 84 | 8 | 103 | C 160 | 160 | 17, 23 | 343 | BF 3 | 330 | 28 | 520 |
| ● 391 | 84 | 8 | 104 | C 250 | 250 | 17 | 344 | BF 4 | 550 | 28 | 521 |
| ● 392 | 84 | 8 | 105 | C 300 | 300 | 18 | 345 | FN 30 | 390 | 27 | 526 |
| ● 389 F | 84 | 8 | 112 | C 350 | 350 | 18 | 346 | FN 100 | 195 | 27, 28 | 527 |
| ● 393 | 100 | 8 | 127 | C 450 | 450 | 18 | 347 | 601/PE | 140 | 14, 17, 21 | 601 |
| 288 | 80 | 9 | 201 | FT55 | 55 | 15 | 348 | 480 | 85 | 15, 19 | 602 |
| 289 | 80 | 9, 11 | 202 | SB 2 | 155 | 17 | 350 | Biophan | | 24 | 603 |
| 290 | 80 | 9 | 203 | 131 | 80 | 15 | 351 | Lead acetate | | 25 | 603 |
| 291 | 80 | 9 | 204 | 10 | 120 | 16 | 352 | Litmus paper | | 25 | 603 |
| 292 | 87 | 9, 11 | 205 | 50 S | 120 | 14, 17 | 353 | Phosphate test paper | | 25 | 603 |
| 1288 | 84 | 10 | 206 | 601/N | 65 | 13, 15 | 354 | Potassium iodide starch paper | | 25 | 603 |
| 1289 | 84 | 10 | 207 | C 251 | 250 | 17 | 355 | Stuphan | | 24 | 603 |
| 1290 | 84 | 10 | 208 | C 140 | 140 | 16 | 356 | Unitest | | 24 | 603 |
| 1291 | 84 | 10 | 209 | 51 S | 120 | 14, 17 | 366 | 470 | 140 | 11, 12, 13, 16, 20 | 606 |
| 1292 | 84 | 10 | 210 | S 165 | 165 | 17 | 368 | MGA | 55 | 32, 33 | 1101 |
| 293 | 80 | 9, 12 | 211 | 64 | 100 | 17, 25 | 403 | MGB | 140 | 32, 33 | 1102 |
| 292 a | 97 | 9 | 215 | 64 a | 135 | 17, 25 | 405 | MGC | 52 | 32, 33 | 1103 |
| 3 h | 65 | 15 | 302 | A 140 | 140 | 17 | 411 | MGD | 120 | 32, 33 | 1104 |
| 3 hw | 65 | 13, 15 | 303 | A 250 | 250 | 17 | 412 | MGF | 75 | 32, 33 | 1105 |
| 3 m/N | 65 | 15 | 305 | LF 1 | 360 | 18 | 413 | T293 | 85 | 34 | 1109 |
| 3 S/h | 200 | 16 | 307 | M 270 | 270 | 18 | 415 | 30 | | 29, 30 | 1201 |
| 3 w | 65 | 15 | 308 | M 600 | 600 | 18 | 416 | 40 | | 29, 31 | 1204 |
| 4 b | 75 | 15 | 309 | S 500 | 500 | 18 | 421 | T293 (thimbles) | | 29, 31 | 1207 |
| 6 | 80 | 11, 14, 15 | 312 | 5 H/N | 85 | 16 | 423 | 35 | | 29, 30 | 1210 |
| 6 S/N | 145 | 14, 16 | 314 | 431 ZY | 500 | 18 | 431 | | | | |
| 17 | 90 | 16 | 319 | TFN | 180 | 22 | 460 | | | | |
| 17/N | 90 | 16 | 321 | 41 b | 75 | 11, 15 | 462 | | | | |
| 69 K | 155 | 16 | 326 | 37/N | 135 | 12, 16 | 480 | | | | |
| 100/N | 85 | 13, 16 | 328 | 39/N | 175 | 12, 16 | 483 | | | | |
| 132 | 80 | 15 | 329 | FN 1 | 90 | 26 | 501 | | | | |
| 460/N | 90 | 16 | 332 | FN 2 | 120 | 26 | 502 | | | | |
| 488/N | 65 | 15 | 333 | FN 3 | 90 | 26 | 503 | | | | |
| 603 | 75 | 15 | 334 | FN 4 | 120 | 26 | 504 | | | | |
| 603/N | 75 | 15 | 335 | FN 5 | 90 | 26 | 505 | | | | |
| | | | | FN 6 | 120 | 26 | 506 | | | | |
| | | | | FN 7 | 150 | 27 | 507 | | | | |
| | | | | FN 7a | 200 | 27 | 508 | | | | |
| | | | | FN 8 | 280 | 27 | 509 | | | | |

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