

GE Healthcare
Life Sciences

Quality matters

Whatman™ filtration products
for pharmaceutical quality control.



Support

Productivity

Confidence

Reliability

Reproducibility



Quality matters

Why does quality matter?

Quality matters because you need to focus on conducting rigorous pharmaceutical quality control (QC) without worrying about the quality of the materials you use on a daily basis. That is why GE Healthcare Life Sciences is committed to supporting your pharmaceutical QC goals with high-quality Whatman filtration products that meet the highest standards—from beginning to the end of the manufacturing and QC process.

This brochure highlights the extensive range of GE Healthcare filtration solutions for pharmaceutical quality control offered under the Whatman brand. Whatman filter papers are world-renowned as a standard for laboratory filtration and are associated with quality, reliability, and customer service. Choosing Whatman filters means:

- A broad range of filtration options to meet any specific requirements you may have
- High reproducibility in order to allow for consistent performance
- Products manufactured to strict quality standards in ISO certified facilities



Fig 1: GE Healthcare has chosen ISO 9001: 2008 as the quality standard for our Quality Management System.

Complete range of innovative Whatman filtration products for pharmaceutical quality control

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Sample filtration

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Essential laboratory accessories - Page 17

- ▶ Phase separation
- ▶ Bench protection
- ▶ Optical lens cleaning
- ▶ pH testing
- ▶ Weighing
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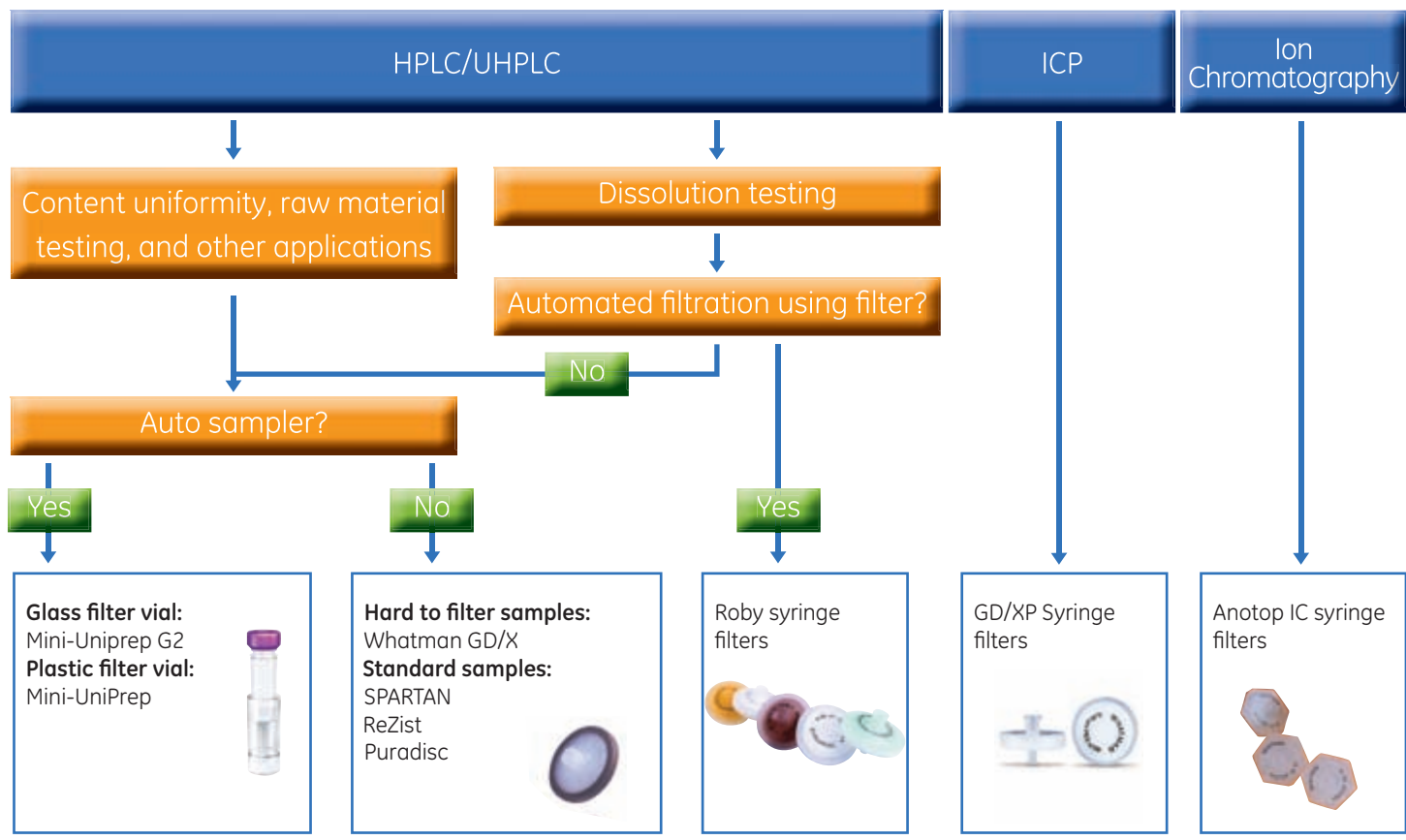
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Chemical compatibility of membranes and housings - Page 19

Analytical testing (including dissolution testing)

Syringe filters and filter vials selection tree according to analytical technique



Syringe filters overview

| Syringe filter type | Without prefilter | | | | With prefilter | | For dissolution testing |
|---------------------|-------------------|--|--|--|----------------|--|-------------------------|
|---------------------|-------------------|--|--|--|----------------|--|-------------------------|

| Product | Puradisc | SPARTAN | Anotop IC | ReZist | Whatman GD/X™ | GD/XP | Roby |
|-----------------------------------|---|--|-----------------------------|---|---|---|---|
| Main feature | Complete range | Regenerated cellulose membrane HPLC certified | Each batch certified for IC | PTFE membrane (for aggressive solvents) | For hard to filter samples | For hard to filter samples with low inorganic ions levels | For automated systems |
| Pre-Filter | N/A | N/A | N/A | N/A | Multilayer glass fiber prefilter GMF150 10-1 µm GF/F 0.7 µm | Multilayer polypropylene prefilter (20-5 µm) | Glass fiber prefilter on select products |
| Diameter | 4, 13, 25, or 30 mm | 13 or 30 mm | 10 or 25 mm | 13 or 30 mm | 13 or 25 mm | 25 mm | 25 mm |
| Main available pore sizes | 0.1, 0.2, 0.45, 0.8, 1.0, 1.2, 5 µm | 0.2 or 0.45 µm | 0.2 µm | 0.2 or 0.45 µm | 0.2, 0.45, 0.7, 1.0, 1.2, 1.5, 2.7, 5.0 µm | 0.45 µm | 0.45 µm 0.7 µm 1.0 µm |
| Main membrane materials available | Cellulose acetate, Nylon, PES, PVDF, PP, PTFE | Regenerated cellulose | Aluminium oxide | PTFE | Cellulose acetate, Nylon, PES, PVDF, PP, PTFE, RC | Nylon, PES, PVDF, PP, PTFE | Nylon, cellulose acetate, regenerated cellulose, glass fiber GF55, glass fiber GF92 |

Mini-UniPrep filter vials for increased throughput

Whatman Mini-UniPrep Syringeless Filters provide a faster, easier way to remove particulates from samples being prepared for HPLC/UHPLC analysis. Syringeless filters simplify your workflow and reduce waste generated in the lab by replacing four different components with one Mini-UniPrep. Two versions are available: the Mini-UniPrep G2 with a glass vial and the original Mini-UniPrep polypropylene version.

Features:

- ▶ Consists of an integral borosilicate glass (G2 version) or polypropylene autosampler vial, plunger with attached filter membrane, and septum/cap
- ▶ Designed to be loaded directly into the autosampler
- ▶ Compatible with any autosampler that accommodates standard 12 mm x 32 mm profile vials (needle height of the autosampler may need adjusting)
- ▶ Versions available with slit septum
- ▶ Versions available with amber housing for light sensitive samples

Benefits:

- ▶ Replaces syringe, syringe filter, vial, and cap
- ▶ Time savings with multicompressors (6 or 8 positions)
- ▶ Waste and cost reduction
- ▶ Includes visual indication that the sample has been filtered
- ▶ Minimizes instrument downtime due to unfiltered samples

Mini-UniPrep G2 Syringeless Filter with inner glass storage vial

- ▶ Consists of an integral borosilicate glass autosampler vial, plunger with attached filter membrane, and septum/cap
- ▶ Glass construction minimizes the risk of leachables contaminating the sample
- ▶ Use with hand-held manual compressor or multicompressor shown in figures 3 and 4



Fig 3: Left: Multi-unit compressor holding eight Mini-UniPrep G2 filters Right: Single Mini-UniPrep G2 filter in a hand compressor. The compressors shown are for illustration purposes only and are not intended to represent the actual compressors. It is the buyer's responsibility to clarify with the seller the exact design of the compressors.



Fig 2: Mini-UniPrep glass (left) and plastic versions. Once compressed, the dimensions are equivalent in size to 12 mm x 32 mm vial.

Mini-UniPrep Syringeless Filter Polypropylene housing

- ▶ Polypropylene housing
- ▶ Use with 6 position multicompressor



Fig 4: The multicompressor of the Mini-UniPrep polypropylene version holds 6 vials.

Ordering information - Mini-UniPrep with polypropylene housing

| Pore size | Housing | Cap | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Quantity |
|-----------|---------------|-------------|-------------|-------------|-------------|------------|------------|-------------|----------|
| | Membrane type | | PTFE | PVDF | Nylon | PP | RC | PES | |
| 0.2 µm | Translucent | Standard | UN203NPEORG | UN203NPEAQU | UN203NPENYL | UN203NPEPP | UN203NPERC | UN203NPEPES | 100/pack |
| 0.45 µm | Translucent | Standard | UN203NPUORG | UN203NPUAQU | UN203NPUNYL | UN203NPUPP | UN203NPURC | UN203NPUPES | 100/pack |
| 0.2 µm | Amber | Standard | UN203APEORG | UN203APEAQU | UN203APENYL | UN203APEPP | | UN203APEPES | 100/pack |
| 0.45 µm | Amber | Standard | UN203APUORG | UN203APUAQU | UN203APUNYL | UN203APUPP | | UN203APUPES | 100/pack |
| 0.2 µm | Translucent | Slit septum | US203NPEORG | US203NPEAQU | US203NPENYL | US203NPEPP | | US203NPEPES | 100/pack |
| 0.45 µm | Translucent | Slit septum | US203NPUORG | US203NPUAQU | US203NPUNYL | US203NPUPP | | | 100/pack |

Ordering information - Mini-UniPrep G2 with inner glass storage vial

| Pore size | Housing | Cap | Code no. | Code no. | Code no. | Code no. | Quantity |
|--------------|---------------|-------------|---------------|---------------|---------------|--------------|---------------|
| | Membrane type | | PTFE | PVDF | Nylon | PP | |
| 0.2 µm (HC) | Translucent | Standard | GN203NPEORGSP | GN203NPEAQUSP | GN203NPENYLSP | GN203NPEPPSP | 100/pack + HC |
| 0.2 µm | Translucent | Standard | GN203NPEORG | GN203NPEAQU | | GN203NPEPP | 100/pack |
| 0.45 µm (HC) | Translucent | Standard | GN203NPUORGSP | GN203NPUAQUSP | | | 100/pack + HC |
| 0.45 µm | Translucent | Standard | GN203NPUORG | GN203NPUAQU | | | 100/pack |
| 0.2 µm (HC) | Amber | Standard | GN203APEORGSP | GN203APEAQUSP | | | 100/pack + HC |
| 0.2 µm (HC) | Translucent | Slit septum | GS203NPEORGSP | | | | 100/pack + HC |
| 0.45 µm (HC) | Translucent | Slit septum | GS203NPUORGSP | | | | 100/pack + HC |

HC = Includes one Hand Compressor

Ordering information - Mini-UniPrep Compressors

| Compressors suitable for | Description | Code no. | Quantity |
|-----------------------------------|---|-------------|----------|
| Mini-UniPrep G2 (glass vial)* | Hand Compressor - 1 position | MUPG2PWC1 | 1/pack |
| | Multi Compressor - 8 positions (includes 1 Tray)* | MUPG2MCPWC8 | 1/pack |
| | Multi Compressor Tray* | MUPG2MCWT8 | 1/pack |
| Mini-UniPrep (polypropylene vial) | Multi Compressor - 6 positions | CR0000006 | 1/pack |

*Mini-UniPrep G2 multicompressor will be available during 2013.
Please contact your GE Healthcare representative for more information.

SPARTAN™ HPLC - certified syringe filters

SPARTAN is one of the most versatile syringe filters for the majority of HPLC samples. It includes regenerated cellulose (RC) membrane, which is both chemically resistant and free of interfering extractable.

Features and benefits:

- ▶ Versatile: Use for any application requiring a chemically resistant, hydrophilic, low protein-binding membrane
- ▶ Documented batch-to-batch quality delivers reproducible results
- ▶ Optional Mini-Tip outlet (13 mm diameter version) enables filtration into very small vials



Fig 5: SPARTAN syringe filters are tested and certified for the absence of UV-absorbing substances at wavelengths of 210 and 254 nm with water, methanol, and acetonitrile. Batch certificates can be downloaded from: www.gelifesciences.com/certificates

Ordering information - SPARTAN syringe filters

| Membrane | Pore size | Code no. | | | Quantity |
|-----------------------|-----------|----------------|------------------------------|----------------|----------|
| | | 13 mm diameter | 13 mm diameter with mini-tip | 30 mm diameter | |
| Regenerated cellulose | 0.2 µm | 10463100 | 10463040 | 10463060 | 100/pack |
| Regenerated cellulose | 0.2 µm | 10463102 | 10463042 | 10463062 | 500/pack |
| Regenerated cellulose | 0.45 µm | 10463110 | 10463030 | 10463050 | 100/pack |
| Regenerated cellulose | 0.45 µm | 10463112 | 10463032 | 10463052 | 500/pack |

ReZist™ Syringe filters for aggressive organic solvents

Whatman ReZist filters are specifically designed to be resistant to organic solvents. ReZist 30 mm filters can also be used as venting filters for small vessels.

Features and benefits:

- ▶ Excellent chemical resistance against standard organic HPLC solvents
- ▶ 13 mm diameter with Mini-Tip outlet permits filtration into very small vials



Fig 6: 30 mm and 13 mm diameter ReZist syringe filters.

Ordering information – ReZist syringe filters

| Membrane | Pore size | Code no. | | Quantity |
|---------------|-----------|------------------------------|----------------|----------|
| | | 13 mm diameter with mini-tip | 30 mm diameter | |
| PTFE | 0.2 µm | 10463703 | 10463503 | 100/pack |
| PTFE | 0.2 µm | | 10463505 | 500/pack |
| PTFE | 0.45 µm | 10463713 | 10463513 | 100/pack |
| PTFE | 0.45 µm | | 10463515 | 500/pack |
| GF 92 (glass) | > 1 µm | | 10463543 | 100/pack |
| GF 92 (glass) | > 1 µm | | 10463545 | 500/pack |

Roby 25 Syringe filters for automated tablet dissolution testing

Roby 25 Syringe Filters were developed specifically for automated sample filtration in robotic systems.

Features and benefits:

- ▶ Broad choice of membranes
- ▶ Optimized for Sotax™, Caliper™ (Zymark™), and Varian™ tablet testers
- ▶ Available with glass fiber prefilter for the filtration of difficult-to-filter samples
- ▶ Roby 25 Filter validation kit available (kit includes six types of filters: one tube of 25 filters of each type, for a total of 150 filters. Plus filter validation protocol with filter selection aid.)



Fig 7: Roby 25 syringe filters.

Ordering information - Roby 25 mm syringe filters

| Membrane/glass fiber filter | Pore size | Code no. | |
|---|-----------|-----------|-----------|
| | | 200/pack* | 1000/pack |
| Nylon** | 0.45 µm | 10463803 | 10463802 |
| Nylon with GF92 prefilter | 0.45 µm | 10463805 | 10463804 |
| Regenerated cellulose | 0.45 µm | 10463807 | 10463806 |
| Regenerated cellulose with GF92 prefilter | 0.45 µm | 10463809 | 10463808 |
| Cellulose acetate with GF92 prefilter** | 0.45 µm | 10463813 | 10463812 |
| Glass fiber GF55 | 0.7 µm | 10463814 | 10463815 |
| Glass fiber GF92 | 1 µm | 10463801 | 10463800 |

In addition, GE Healthcare offers flat glass fiber filters that are widely used for dissolution testing in semi-automated systems.

Please refer to page 15 for more information on our glass fiber grades such as GF/F.

*8 tubes of 25 pieces each - **not included in the filter validation kit

| Description | Code no. |
|-------------------------------|----------|
| Roby 25 Filter Validation Kit | 10463898 |

Puradisc Syringe filters for routine sample filtration

Puradisc Syringe filters combine quality and economy for filtration of samples up to 100 ml.

Features and benefits:

- ▶ Pigment-free polypropylene housing
- ▶ Standard inlet and outlet luer connectors
- ▶ Choice of filter sizes (4 mm to 30 mm) with optional Tube Tip)
- ▶ Choice of wide variety of membranes or glass microfiber filter media



Fig 8: Puradisc syringe filters.

Ordering information - Puradisc syringe filters, 25 mm*

| Pore size | Code no. | Code no. | Code no. | Code no. | Code no. | Quantity |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Membrane type | Nylon | PVDF | PTFE | PP | PES | |
| 0.2 µm | 6751-2502 | 6747-2502 | 6785-2502 | 6788-2502 | 6781-2502 | 200/pack |
| 0.45 µm | 6751-2504 | 6747-2504 | 6785-2504 | 6788-2504 | 6781-2504 | 200/pack |
| 0.2 µm | | | | | 6759-2502 | 300/pack |
| 0.45 µm | 6752-2504 | | | | | 500/pack |
| 0.2 µm | 6753-2502 | | 6798-2502 | 6790-2502 | 6794-2502 | 1000/pack |
| 0.45 µm | 6753-2504 | 6749-2504 | 6798-2504 | 6790-2504 | 6794-2504 | 1000/pack |

*please contact your GE Healthcare representative for other diameters and pore sizes.

Whatman GD/X™ and GD/XP Syringe filters for hard-to-filter samples

Whatman GD/X and GD/XP are high-quality disposable syringe filters that include prefilters for filtering larger sample volumes quickly. GD/X and GD/XP are excellent for filtering solutions that are heavily contaminated with particulates.

Features and benefits:

- ▶ **Increased volume throughput:** Volume of sample filtered can be three to seven times greater than conventional filters
- ▶ **Superior performance:** up to four layers of filtration media reduce blockage and the need to replace the filter in midoperation
- ▶ **Less hand force required:** The pre-filter layer allows high particulate samples to be filtered with less hand force, minimizing operator fatigue

Whatman GD/X syringe filters (suitable for HPLC and UHPLC analysis)

GD/X syringe filters contain four filtration layers which help reduce blockage and increase volume throughput.

- ▶ Integrated multilayer prefilter (10 µm to 0.7 µm)
- ▶ Prefilter made of glass microfiber
- ▶ Broad choice of final membrane types (0.2 µm or 0.45 µm)
- ▶ 13 mm or 25 mm diameters available

Whatman GD/XP Syringe filters (suitable for ICP sample analysis)

GD/XP syringe filters can be used with samples that require inorganic ion analysis (e.g., trace metal analysis).

- ▶ Integrated dual-layer prefilter stack (20 µm and 5 µm) and one final 0.45 µm membrane
- ▶ Prefilter made of polypropylene for minimization of ion leaches
- ▶ 25 mm diameter

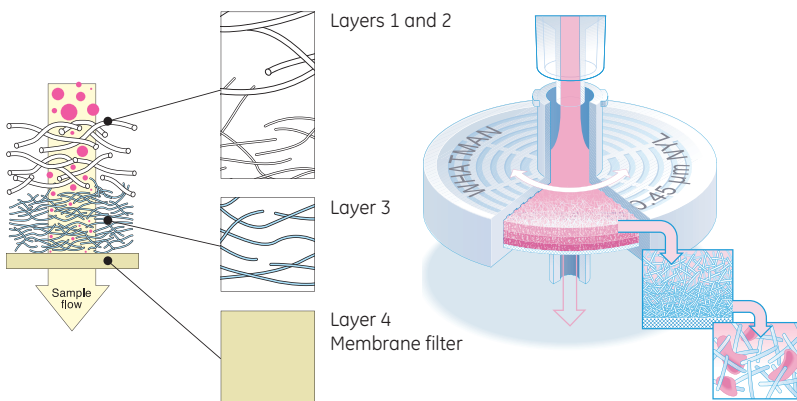


Fig 9: Whatman GD/X and GD/XP Syringe filters contain several filtration layers that substantially reduce blockage and increase volume throughput. This is a schematic representation of Whatman GD/X features only.



Fig 10: GD/X syringe filter.

Ordering information - GD/X and GD/XP syringe filters

| Pore size | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Quantity |
|---------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| GD/X 25 mm with glass fiber prefilter | | | | | | | | |
| Membranet type | Nylon | PVDF | PTFE | PP | PES | RC | CA | |
| 0.2 µm | 6870-2502 | 6872-2502 | 6874-2502 | 6878-2502 | 6876-2502 | 6887-2502 | 6880-2502 | 150 /pack |
| 0.45 µm | 6870-2504 | 6872-2504 | 6874-2504 | 6878-2504 | 6876-2504 | 6882-2504 | 6880-2504 | 150 /pack |
| 0.2 µm | 6871-2502 | 6873-2502 | 6875-2502 | | 6905-2502 | | | 1500 /pack |
| 0.45 µm | 6871-2504 | 6873-2504 | 6875-2504 | 6879-2504 | 6905-2504 | 6883-2504 | 6881-2504 | 1500 /pack |

GD/XP with polypropylene prefilter

| Membranet type | Nylon | PVDF | PTFE | PP | PES | | | |
|----------------|-----------|-----------|-----------|------------|-----------|--|--|-----------|
| 0.45 µm | 6970-2504 | 6972-2504 | 6974-2504 | 6978-2504 | 6994-2504 | | | 150/pack |
| 0.45 µm | 6971-2504 | 6973-2504 | | 6993-2504* | 6995-2504 | | | 1500/pack |

*DdPP- depth polypropylene

Anotop™ IC Syringe filters for ion chromatography (IC)

Whatman Anotop IC filters are for the preparation of samples for subsequent IC and HPLC analysis. These filters contain proprietary alumina-based Anopore™ membrane that enable very low levels of anion leaching during IC testing.

Features and benefits:

- ▶ Very low levels of anion leaching (< 10 to 30 ppb for major anions)
- ▶ Pigment-free PP housing to eliminate sample contamination



Fig 11: Anotop IC syringe filters.

Ordering information - Anotop IC Syringe filters

| Membrane | Pore size | Quantity | Code no. |
|-------------------------------|----------------|----------|-----------|
| Anotop 10 IC (10 mm diameter) | | | |
| Aluminium oxide | 0.2 µm | 50/pack | 6809-9232 |
| Aluminium oxide | 0.2 µm | 100/pack | 6809-9233 |
| Aluminium oxide | 0.2 µm | 200/pack | 6809-9234 |
| Aluminium oxide | 0.2 µm blister | 250/pack | 6809-9235 |

Anotop 25 IC (25 mm diameter)

| | | | |
|-----------------|--------|----------|-----------|
| Aluminium oxide | 0.2 µm | 200/pack | 6809-9244 |
|-----------------|--------|----------|-----------|

Membrane filters for mobile phase filtration

GE Healthcare offers a wealth of experience and knowledge in the area of HPLC/UHPLC mobile phase preparatory membranes.

Features and benefits:

- ▶ A broad range of materials, pore sizes, and diameters
- ▶ Regenerated cellulose membranes (RC) are compatible with aqueous solvents and a vast majority of organic solvents



Fig 12: Whatman regenerated cellulose membranes—a good choice for mobile phase filtration (aqueous and organic).

Ordering information - Membrane filters (circles)

| Membrane | Compatibility* | Pore size | Code no. | | Quantity |
|-----------------------|---|-----------|----------------|----------------|----------|
| | | | 47 mm diameter | 50 mm diameter | |
| Nylon | Aqueous and organic solutions (3<pH<10) | 0.2 µm | 10414012 | 10414014 | 100/pack |
| | | 0.45 µm | 10414112 | 10414114 | 100/pack |
| Regenerated cellulose | Aqueous and organic solutions | 0.2 µm | 10410312 | 10410314 | 100/pack |
| | | 0.45 µm | 10410212 | 10410214 | 100/pack |
| PTFE | Organic solutions | 0.2 µm | 10411411 | 10411413 | 50/pack |
| | | 0.45 µm | 10411311 | 10411313 | 50/pack |

*Refer to table of Chemical Compatibility of Membranes on page 19.

Other membrane materials (such as polycarbonate, cellulose nitrate) with a wide variety of pore sizes, and diameters are available—please contact your GE Healthcare representative for more information.

Whatman GV050/2 vacuum filtration unit

Whatman GV050/2 vacuum filtration unit consists of a 250 ml glass filtration funnel and 1000 ml flask, funnel base, top, and clamp. This apparatus complements the Whatman filtration membranes range.

Ordering information - Vacuum filtration unit

| Product | Code no. |
|-------------------------------------|----------|
| GV050/2 vacuum filter holder 1/pack | 10442200 |



Fig 13: GV050/2 vacuum filtration unit for membrane filtration.

General filtration

Cellulose filter papers

GE Healthcare offers an extensive line of cellulose filter papers. Whatman filters deliver high quality, reproducibility, and uniformity for quality control labs in the pharmaceutical industries.



Fig 14: Pre-pleated filter format.



Fig 15: Whatman flat filter paper (Grade 44).

Features and benefits:

- ▶ Wide choice of retention and flow rate combinations—retention down to 2.5 μm
- ▶ A variety of filters with different levels of purity, hardness, and chemical resistance
- ▶ Pre-pleated format available for some grades: they are suitable for hard-to-filter samples or to increase flow rate

Qualitative cellulose filter papers

Whatman qualitative cellulose filters are for qualitative analytical experiments to determine and identify specific materials.

The two formats available are:

- ▶ Standard qualitative filters papers
- ▶ Wet strengthened filter papers

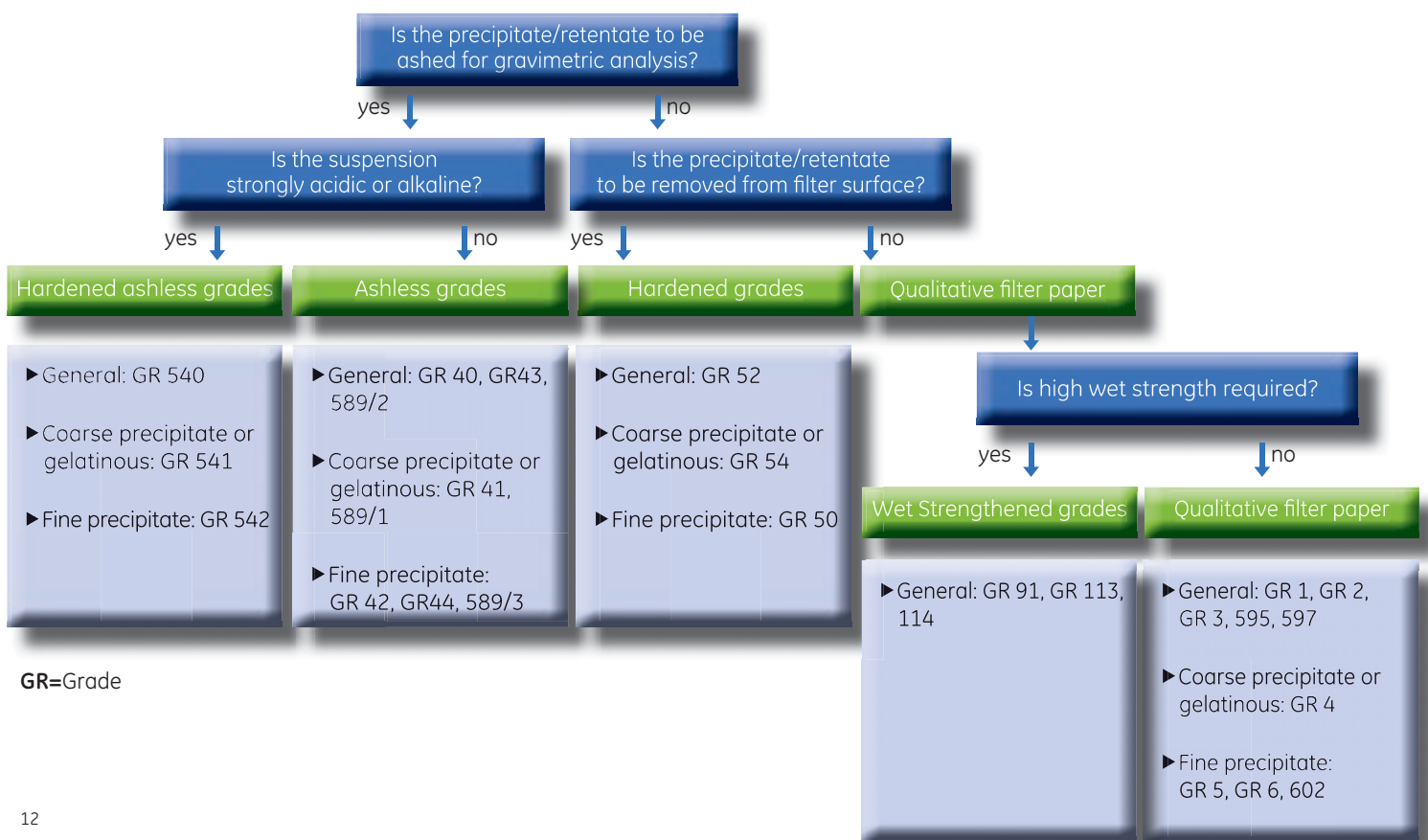
Quantitative cellulose filter papers

Whatman quantitative filters are for gravimetric analysis and the preparation of samples for instrumental analysis.

The three formats available are:

- ▶ Ashless quantitative filter papers
- ▶ Hardened low ash quantitative filter papers
- ▶ Hardened ashless quantitative filter papers

Use the decision tree to identify the filter paper that meets your needs



Typical Properties of Whatman cellulose filter papers

Qualitative filter papers

| Grade | Nominal particle retention in liquid (µm) | Filtration speed (approx) Herzberg (s) | Typical thickness (µm) | Basis weight (g/m ²) | Grade for pre pleated version | Flow – aspect |
|-------|---|--|------------------------|----------------------------------|-------------------------------|---------------|
|-------|---|--|------------------------|----------------------------------|-------------------------------|---------------|

Standard qualitative cellulose filter papers

| | | | | | | |
|------|-------|------|-----|-----|---------------------|-----------------------|
| 1 | 11 | 150 | 180 | 88 | | Medium |
| 2 | 8 | 240 | 190 | 103 | 2V | Medium |
| 3 | 6 | 325 | 390 | 187 | | Medium-thick |
| 4 | 20-25 | 37 | 205 | 96 | | Very fast |
| 5 | 2.5 | 1420 | 200 | 98 | 5V | Slow |
| 6 | 3 | 715 | 180 | 105 | | Medium to slow |
| 595 | 4-7 | 80 | 150 | 68 | 595 ^{1/2} | Medium to fast – thin |
| 597 | 4-7 | 70 | 180 | 85 | 597 ^{1/2} | Medium to fast |
| 602h | <2 | 375 | 160 | 84 | 602h ^{1/2} | Slow |

Qualitative wet strengthened cellulose filter papers

| | | | | | | |
|------|----|-----|-----|-----|---------------------|---------------|
| 113 | 30 | 28 | 420 | 125 | 113V | Fast – creped |
| 114 | 25 | 38 | 190 | 77 | 114V | Fast – smooth |
| 91 | 10 | 70 | 205 | 71 | | Creped |
| 1573 | <2 | 700 | 140 | 92 | 1573 ^{1/2} | Slow |

Quantitative filter papers

| Grade | Nominal particle retention in liquid (µm) | Filtration speed (approx) | Typical thickness (µm) | Basis weight (g/m ²) | Ash content | Flow – aspect |
|-------|---|---------------------------|------------------------|----------------------------------|-------------|---------------|
|-------|---|---------------------------|------------------------|----------------------------------|-------------|---------------|

Ashless quantitative cellulose filter papers

| | | | | | | |
|--------|-------|------|-----|-----|--------|----------------|
| 40 | 8 | 340 | 210 | 95 | 0.007% | Medium |
| 41 | 20 | 54 | 220 | 85 | | Fast |
| 42 | 2.5 | 1870 | 200 | 100 | | Slow |
| 43 | 16 | 155 | 220 | 95 | | Medium to fast |
| 44 | 3 | 995 | 180 | 80 | | Slow to medium |
| 589/1* | 12-25 | 25 | 190 | 80 | 0.01% | Fast |
| 589/2* | 4-12 | 70 | 190 | 85 | | Medium to fast |
| 589/3 | <2 | 750 | 150 | 84 | | Slow |

Hardened low ash quantitative cellulose filter papers

| | | | | | | |
|----|-----|------|-----|-----|--------|--------|
| 50 | 2.7 | 2685 | 115 | 97 | 0.015% | Slow |
| 52 | 7 | 235 | 175 | 101 | | Medium |
| 54 | 22 | 39 | 185 | 92 | | Fast |

Hardened ashless quantitative cellulose filter papers

| | | | | | | |
|-----|-----|------|-----|----|--------|--------|
| 540 | 8 | 200 | 115 | 88 | 0.006% | Medium |
| 541 | 22 | 34 | 175 | 82 | | Fast |
| 542 | 2.7 | 2510 | 185 | 93 | | Slow |

* Pre-pleated versions available

Maximum practical volumes of circle sizes (quadrant folded)

| | | | | | | |
|----------------------|----|-----|-----|-----|-----|-----|
| Volume (ml) | 15 | 20 | 35 | 75 | 135 | 300 |
| Filter Diameter (mm) | 90 | 110 | 125 | 150 | 185 | 240 |

Ordering information – Qualitative filter papers - 100/pack

| Diameter | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. |
|-------------|----------|----------|----------|----------|----------|----------|-----------|-----------|------------|
| Qualitative | Grade 1 | Grade 2 | Grade 3 | Grade 4 | Grade 5 | Grade 6 | Grade 595 | Grade 597 | Grade 602H |
| 42.5 mm | 1001-042 | 1002-042 | | 1004-042 | 1005-042 | 1006-042 | | | |
| 55 mm | 1001-055 | 1002-055 | 1003-055 | 1004-055 | 1005-055 | | | 10311807 | |
| 70 mm | 1001-070 | 1002-070 | 1003-070 | 1004-070 | 1005-070 | 1006-070 | | 10311808 | |
| 90 mm | 1001-090 | 1002-090 | 1003-090 | 1004-090 | 1005-090 | 1006-090 | | 10311809 | |
| 110 mm | 1001-110 | 1002-110 | 1003-110 | 1004-110 | 1005-110 | 1006-110 | 10311610 | 10311810 | |
| 125 mm | 1001-125 | 1002-125 | 1003-125 | 1004-125 | 1005-125 | 1006-125 | 10311611 | 10311811 | 10312611 |
| 150 mm | 1001-150 | 1002-150 | 1003-150 | 1004-150 | 1005-150 | 1006-150 | 10311612 | 10311812 | 10312612 |
| 185 mm | 1001-185 | 1002-185 | 1003-185 | 1004-185 | 1005-185 | 1006-185 | | 10311814 | 10312614 |
| 240 mm | 1001-240 | 1002-240 | 1003-240 | 1004-240 | 1005-240 | 1006-240 | | 10311820 | 10312620 |

Qualitative wet strengthened

Grade 91* Grade 113 Grade 114 Grade 1573

| | | | | | | | | | |
|--------|----------|----------|----------|----------|--|--|--|--|--|
| 90 mm | | 1113-090 | 1114-090 | | | | | | |
| 110 mm | | 1113-110 | | | | | | | |
| 125 mm | | 1113-125 | 1114-125 | | | | | | |
| 150 mm | 1091-150 | 1113-150 | 1114-150 | 10314712 | | | | | |
| 185 mm | 1091-185 | 1113-185 | 1114-185 | 10314714 | | | | | |
| 240 mm | 1091-240 | 1113-240 | 1114-240 | | | | | | |

Qualitative pre-pleated

Grade 2V Grade 113V Grade 114V Grade 595^{1/2} Grade 597^{1/2} Grade 602h^{1/2} Grade 1573^{1/2}

| | | | | | | | | | |
|--------|----------|----------|----------|----------|----------|----------|----------|--|--|
| 70 mm | | | | 10311641 | 10311841 | | | | |
| 90 mm | | | | 10311642 | 10311842 | 10312642 | | | |
| 110 mm | | | | 10311643 | 10311843 | | | | |
| 125 mm | 1202-125 | 1213-125 | 1214-125 | 10311644 | 10311844 | 10312644 | 10314744 | | |
| 150 mm | 1202-150 | 1213-150 | 1214-150 | 10311645 | 10311845 | 10312645 | 10314745 | | |
| 185 mm | 1202-185 | 1213-185 | 1214-185 | 10311647 | 10311847 | 10312647 | 10314747 | | |
| 240 mm | 1202-240 | 1213-240 | 1214-240 | 10311651 | 10311851 | 10312651 | 10314751 | | |

Ordering information – Quantitative filter papers 100/pack

| Diameter | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. |
|----------|----------|----------|----------|----------|----------|--------------------------|--------------------------|-------------|
| Ashless | Grade 40 | Grade 41 | Grade 42 | Grade 43 | Grade 44 | Grade 589/1 | Grade 589/2 | Grade 589/3 |
| 90 mm | 1440-090 | 1441-090 | 1442-090 | 1443-090 | 1444-090 | 10300009 | 10300109 | |
| 110 mm | 1440-110 | 1441-110 | 1442-110 | 1443-110 | 1444-110 | 10300010 | 10300110 10300143 (P) | 10300210 |
| 125 mm | 1440-125 | 1441-125 | 1442-125 | 1443-125 | 1444-125 | 10300011 | 10300111 | 10300211 |
| 150 mm | 1440-150 | 1441-150 | 1442-150 | 1443-150 | 1444-150 | 10300012 10300045 (P) | 10300112 10300145 (P) | 10300212 |
| 185 mm | 1440-185 | 1441-185 | 1442-185 | 1443-185 | 1444-185 | 10300014 | 10300114 | 10300214 |
| 240 mm | 1440-240 | 1441-240 | 1442-240 | | | | 10300120 | |

Hardened and Hardened ashless

Grade 50 Grade 52 Grade 54 Grade 540 Grade 541 Grade 542

| | | | | | | | | |
|--------|----------|----------|----------|----------|----------|----------|--|--|
| 90 mm | 1450-090 | 1452-090 | 1454-090 | 1540-090 | 1541-090 | 1542-090 | | |
| 110 mm | 1450-110 | 1452-110 | 1454-110 | 1540-110 | 1541-110 | 1542-110 | | |
| 125 mm | 1450-125 | 1452-125 | 1454-125 | 1540-125 | 1541-125 | 1542-125 | | |
| 150 mm | 1450-150 | 1452-150 | 1454-150 | 1540-150 | 1541-150 | 1542-150 | | |
| 185 mm | 1450-185 | | 1454-185 | 1540-185 | 1541-185 | 1542-185 | | |
| 240 mm | 1450-240 | 1452-240 | 1454-240 | 1540-240 | 1541-240 | 1542-240 | | |

Glass fiber filters

We provide Whatman binder free glass microfiber filters manufactured from 100% borosilicate glass for use in many applications such as general clarification, dissolution testing or prefiltration.

Features and benefits:

- ▶ Depth filters
- ▶ Fast flow rates
- ▶ High loading capacity
- ▶ Retention of very fine particles, extending into the sub-micron range



Fig 16: Whatman binder free glass fiber filters.

Typical properties of glass fiber filters

| Product | Filtration speed | Particle retention in liquid (µm) | Typical thickness (µm) | Basic weight (g/m ²) |
|---------------------------|------------------|-----------------------------------|------------------------|----------------------------------|
| Grade GF/A | Fast | 1.6* | 260 | 53 |
| Grade GF/B | Medium to fast | 1.0* | 675 | 143 |
| Grade GF/C™ | Medium to fast | 1.2* | 260 | 53 |
| Grade GF/D | Fast | 2.7* | 675 | 121 |
| Grade GF/F | Medium | 0.7* | 420 | 75 |
| GMF 150 1 µm - Multilayer | Medium to fast | 1.2* | 730 | 139 |

*Particle retention rating at 98% efficiency

Ordering information - Glass fiber filters - 100/pack

| Diameters ** | Code no. | Code no. | Code no. | Code no. | Code no. | Code no. |
|--------------|------------|------------|------------|------------|------------|--------------------|
| Glass fiber | Grade GF/A | Grade GF/B | Grade GF/C | Grade GF/D | Grade GF/F | Grade GMF 150 1 µm |
| 25 mm | 1820-025 | 1821-025 | 1822-025 | 1823-025 | 1825-025 | |
| 42.5 mm | 1820-042 | 1821-042 | 1822-042 | 1823-042 | 1825-042 | |
| 47 mm | 1820-047 | 1821-047 | 1822-047 | 1823-047 | 1825-047 | 1841-047 |
| 55 mm | 1820-055 | 1821-055 | 1822-055 | 1823-055 | 1825-055 | |
| 70 mm | 1820-070 | 1821-070 | 1822-070 | 1823-070 | 1825-070 | |
| 90 mm | 1820-090 | 1821-090 | 1822-090 | 1823-090 | 1825-090 | 1841-090 |

**Other grades and dimensions are also available—please contact your GE Healthcare representative for more information

Autovial™ Syringeless filters

Autovial syringeless filters are preassembled filtration devices for removing particulates from samples. They replace syringes & syringe filters with a single, disposable device simplifying your filtration step.

Ordering information - Autovial syringeless filters - 5ml capacity

| Pore size | Code no. | Code no. | Code no. | Code no. | Quantity |
|---------------|-------------|-------------|-------------|-----------|----------|
| Membrane type | PTFE | PVDF | Nylon | GMF | |
| 0.2 µm | AV115NPEORG | | | | 50/pack |
| 0.45 µm | AV115NPUORG | AV115NPUAQU | AV115NPUNYL | AV115UGMF | 50/pack |



Fig 17: Autovial 5 syringeless filter.

Microbiological testing

Sterile membrane filters for microbiology

GE Healthcare provides a wide and versatile range of Whatman membrane filters for membrane filtration-based microbiology that consistently deliver high-quality performance.

- ▶ Cellulose mixed ester membranes—ME Standard type and ME 25 Select with improved recovery rate
- ▶ Cellulose nitrate membranes—MicroPlus type

These membranes are sterile, packed individually, and available in two formats:

- ▶ Standard format
- ▶ STL format for use with a membrane dispenser. They are compatible with most commercially available membrane dispensers, including GE Healthcare's membrane dispenser (see below)

Membranes are also available in black-plain and black-gridded formats.



Fig 18: STL membranes for use with a membrane dispenser.

Membrane dispenser saves time

Whatman membrane-butler: with each turn, a membrane filter is ejected from its sterile packaging and it can be removed easily with a pair of tweezers as shown in figure 19.

| Description | Code no. | Quantity |
|----------------------------------|----------|----------|
| Membrane Butler - Manual version | 10477100 | 1/pack |



Fig 19: Membrane-Butler membrane dispenser.

GE Healthcare also offers filtration manifolds and funnels for microbiology. Please contact your GE Healthcare representative.

Ordering information - sterile membrane filters

| Membrane type | Material | Pore size | For membrane dispenser? | Code no. | | Quantity |
|---------------|---|-----------|-------------------------|------------|------------|----------|
| | | | | Diam 47 mm | Diam 50 mm | |
| ME type | Cellulose mixed ester | 0.2 µm | No | 10406970 | 10406972 | 100/pack |
| | | 0.2 µm | Yes | 10408712 | 10408714 | 400/pack |
| | | 0.45 µm | No | 10406870 | 10406872 | 100/pack |
| | | 0.45 µm | Yes | 10407312 | 10407314 | 400/pack |
| ME25 Select | Cellulose mixed ester (improved recovery) | 0.45 µm | No | 10406800 | 10406801 | 100/pack |
| | | 0.45 µm | Yes | 10406803 | 10406802 | 400/pack |
| Microplus | Cellulose nitrate | 0.45 µm | No | 10407713 | 10407714 | 100/pack |
| | | 0.45 µm | Yes | 10407112 | 10407114 | 400/pack |

The membranes listed above are white with a black grid—other membrane colors and pore sizes are available. Please contact your local GE Healthcare representative.

More than filtration

Essential laboratory accessories

In addition to the filtration consumable range, we provide a comprehensive range of accessories for routine work in your laboratory. The table below shows a selection of the products we offer.



1PS phase separator



Grade 105 lens cleaning tissue



Benchkote™ protection paper



pH papers



Vacu-Guard Pump protection filter

| Description | Product name | Dimension | Code no. | Qty/pack |
|---|---|---------------|--------------|-------------------------|
| Phase separation paper <ul style="list-style-type: none"> •Automatic cut-off: Separatory Funnel Replacement •Ease of use: No special training required | 1PS Phase separator paper | Diam. 125 mm | 2200-125 | 100 |
| | | Diam. 150 mm | 2200-150 | 100 |
| Optical lens cleaning tissue <ul style="list-style-type: none"> •For removal surface moisture and grease from lenses and other optical surfaces which can be easily scratched if you do not clean them with a very soft surface | Grade 105 | 100 × 150 mm | 2105-841 | 25 wallets of 25 sheets |
| | | | 200 × 300 mm | 2105-862 |
| Benchkote bench protection papers <ul style="list-style-type: none"> •High-quality, smooth, absorbent Whatman paper •Quickly absorbs liquid spills and protects the working surface •Benchkote Plus is thicker and more absorbent | Benchkote | 460 × 570 mm | 2300-916 | 50 |
| | | 460 mm × 50 m | 2300-731 | 1 reel |
| | Benchkote Plus | 500 × 600 mm | 2301-6150 | 50 |
| | | 600 mm × 50 m | 2301-6160 | 1 reel |
| Weighing papers <ul style="list-style-type: none"> •Designed for weighing and transferring samples safely and reliably •Minimized influence on analytical results | Grade 2122 | 100 × 100 mm | 10347893 | 500 |
| | Grade B-2 Sheets | 3 × 3 inch | 10347671 | 500 |
| Antibiotic assay papers <ul style="list-style-type: none"> •For determining the type of causal agent of infectious diseases and checking their sensitivity to antibiotics and chemotherapeutic agents in vitro based on the inhibition zone determination method | Antibiotic Assay Discs | 6 mm | 2017-006 | 1000 |
| pH Indicator Papers <ul style="list-style-type: none"> •Range of pH indicator and test papers for the rapid determination of pH values in many applications | Colour Bonded, 0.0 to 14.0 range | 6 × 80 mm | 2613-991 | 100 strips |
| | Standard Full Range, Reel, 1.0 to 14.0 range | 7 mm × 5 m | 2600-100A | 1 |
| | Standard Narrow Range, Reel, 4.0 to 7.0 range | 7 mm × 5 m | 2600-102A | 1 |
| Pump protection filters <ul style="list-style-type: none"> •Protects vacuum pump systems from aqueous aerosols. Hydrophobic PTFE membranes retain 99.99% or airborne particles > 0.1 µm | Vacu-Guard | 50 mm | 6722-5000 | 10 |

For more product information, please contact your GE Healthcare representative and technical support.

Discover GE Healthcare Pharmacopeia-compatible spectrophotometers

Ultrospec spectrophotometers are dual-beam UV Visible spectrophotometers for use in high specification laboratories. Variable bandwidth capability and custom calculation facilities support method development.

- ▶ 1 nm or variable bandwidth supports European Pharmacopeia compatibility
- ▶ 21 CFR part 11 support through Datrys CFR software (optional)
- ▶ High-performance dual-beam wavelength range 190 to 1100 nm

Contact your GE Healthcare representative to get more information on our range of spectrophotometers or visit www.gelifsciences.com/spectros



Fig 20: Ultrospec 9000 stand-alone instrument.

Ask us about bioprocessing and research solutions

In addition to the range of products suitable for quality control laboratories, we provide expertise and tools for a wide range of applications, including basic research, drug discovery research, and tools to support large-scale manufacturing of biopharmaceuticals.

This includes:

- ▶ Bioprocessing solutions for upstream and downstream operations including process-scale filtration applications
- ▶ Protein and cell analyses products that support drug discovery from target identification to lead optimization and predictive toxicity testing
- ▶ Investigational protein and cell analyses to understand the cause(s) of diseases
- ▶ Nucleic acid research tools
- ▶ Preparative protein purification and research tools
- ▶ Cell bioprocessing for cell therapy (i.e., the separation, isolation, and expansion of cells)



BioProcess™ filters and systems support process-scale filtration applications, including clarification, sterile filtration and UF/DF operations.



GE Healthcare protein and cell analysis equipment provide deep insights and early predictions of lead efficacy and safety.

Chemical compatibility of membranes and housings

| Solvent | ANP | CA | CN | PC | PE | GMF | NYL | PP | DpPP | PES | PTFE** | PVDF | RC |
|--------------------------|-----|----|----|----|----|-----|-----|----|------|-----|--------|------|----|
| Acetic Acid, 5% | R | LR | R | R | | R | R | R | R | R | R | R | R |
| Acetic Acid, Glacial | R | NR | NR | | | R | LR | R | R | R | R | R | NR |
| Acetone | R | NR | NR | NR | R | R | R | R | R | NR | R | NR | R |
| Acetonitrile | R | NR | NR | | | R | R | R | R | NR | R | R | R |
| Ammonia, 6N | NR | | NR | NR | LR | LR | R | R | R | R | R | LR | LR |
| Amyl Acetate | LR | NR | NR | NR | R | R | R | R | R | LR | R | LR | R |
| Amyl Alcohol | R | LR | LR | | | R | R | R | R | NR | R | R | R |
| Benzyl Alcohol* | R | LR | LR | LR | R | R | LR | R | R | NR | R | R | R |
| Butyl Alcohol | R | R | R | R | R | R | R | R | R | R | R | R | R |
| Butyl Chloride* | | | | | | R | NR | NR | NR | | R | R | |
| Carbon Tetrachloride* | R | NR | R | LR | R | R | LR | NR | NR | NR | R | R | R |
| Chloroform* | R | NR | R | NR | R | R | NR | LR | LR | NR | R | R | R |
| Chlorobenzene* | R | | LR | NR | | R | NR | LR | | NR | R | R | R |
| Citric Acid | | | | | | R | LR | R | | R | R | R | R |
| Cyclohexanone | R | NR | NR | | | R | NR | R | R | NR | R | R | R |
| Cyclohexane* | R | NR | NR | R | R | R | NR | NR | NR | NR | R | R | R |
| Diethyl Acetamide | | NR | NR | | | R | R | R | R | | R | NR | R |
| Dimethyl Formamide | LR | NR | NR | | | R | R | R | R | NR | R | NR | LR |
| Dioxane | R | NR | NR | NR | R | R | R | R | R | LR | R | LR | R |
| DMSO | LR | NR | NR | NR | R | R | R | R | R | NR | R | LR | LR |
| Ethanol | R | R | NR | R | R | R | R | R | R | R | R | R | R |
| Ethers* | R | LR | LR | R | R | R | R | NR | NR | R | R | LR | R |
| Ethyl Acetate | R | NR | NR | NR | R | R | R | R | R | NR | R | NR | R |
| Ethylene Glycol | R | LR | LR | R | R | R | R | R | R | R | R | R | R |
| Formaldehyde* | LR | LR | R | R | R | R | R | LR | LR | R | R | R | LR |
| Hexane | R | R | R | R | R | R | R | R | R | R | R | R | R |
| Hydrochloric Acid, Conc* | NR | NR | NR | NR | NR | R | NR | LR | LR | R | R | R | NR |
| Isobutyl Alcohol | R | LR | LR | R | R | R | R | R | R | | R | R | R |
| Isopropyl Alcohol | R | R | LR | | | R | R | R | R | | R | R | R |
| Methanol | R | R | NR | R | R | R | R | R | R | R | R | R | R |
| Methyl Ethyl Ketone | R | LR | NR | NR | R | R | R | R | R | NR | R | NR | R |
| Methylene Chloride* | R | NR | LR | | | R | NR | LR | LR | NR | R | R | R |
| Nitric Acid, Conc* | | NR | NR | LR | NR | R | NR | NR | NR | NR | R | R | NR |
| Nitric Acid, 6N* | | LR | LR | | | R | NR | LR | LR | LR | R | R | LR |
| Nitrobenzene* | LR | NR | NR | NR | R | R | LR | R | R | NR | R | R | R |
| Pentane* | R | R | R | R | R | R | R | NR | NR | R | R | R | R |
| Phenol 0.5% | LR | LR | R | | | R | NR | R | R | NR | R | R | R |
| Pyridine | R | NR | NR | NR | R | R | LR | R | R | NR | R | NR | R |
| Sodium Hydroxide, 6N | NR | NR | NR | NR | NR | NR | LR | R | R | R | R | NR | NR |
| Sulfuric Acid, Conc* | NR | NR | NR | NR | NR | R | NR | NR | NR | NR | R | NR | NR |
| Tetrahydrofuran* | R | NR | NR | | | R | R | LR | LR | NR | R | R | R |
| Toluene* | R | LR | R | NR | R | R | LR | LR | LR | NR | R | R | R |
| Trichloroethane* | R | NR | LR | NR | R | R | LR | LR | LR | NR | R | R | R |
| Trichloroethylene* | R | | R | | | R | NR | LR | LR | NR | R | R | R |
| Water | R | R | R | R | R | R | R | R | R | R | R | R | R |

R = Resistant; LR = Limited Resistance; NR = Not Recommended; * = Short Term Resistance of Housing

The above data is to be used as a guide only. Testing prior to application is recommended.

** = membrane may need pre-wetting with isopropanol/methanol if filtering a polar liquid

ANP = Anopore; CA = Cellulose Acetate; CN = Cellulose Nitrate; DpPP = Polypropylene Depth Filter; GMF = Glass Microfiber; NYL = Nylon; PC = Polycarbonate; PE = Polyester; PES = Polyethersulfone; PP = Polypropylene; PTFE = Polytetrafluoroethylene; PVDF = Polyvinylidene Difluoride; RC = Regenerated Cellulose



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