Brewing laboratory filtration applications

cytiva

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Introduction

An effective laboratory QC/QA program executed throughout brewing workflows helps maintain the uniformity of manufacturing processes and ensures consistency of final products. This safeguards the taste profile, product safety, and overall quality of beer.

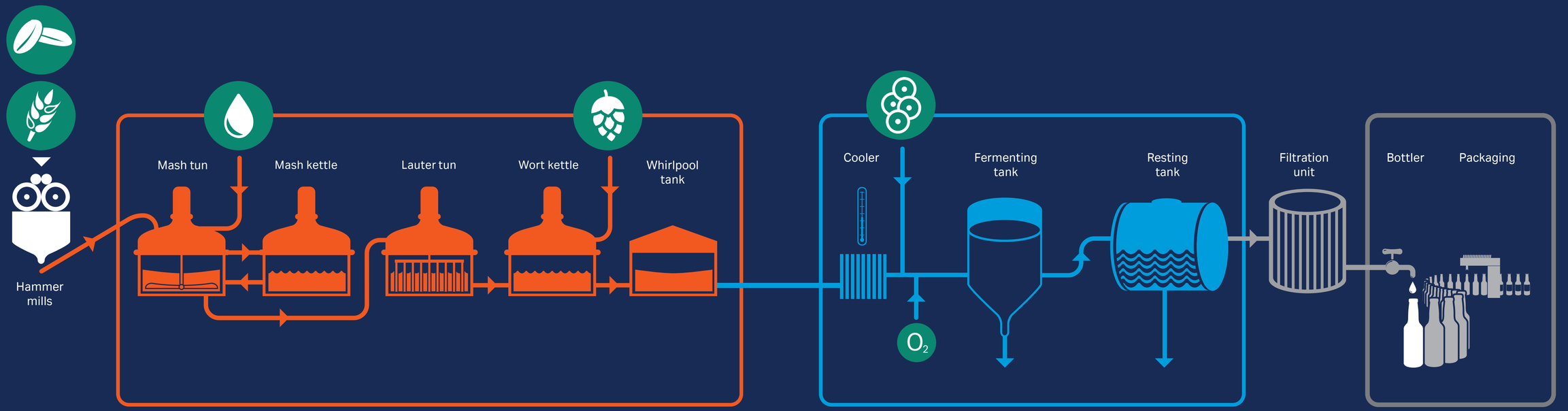
Several analytical and microbiological methods are used in brewing quality control. The correct selection of filtration devices used in these tests can have a major impact on laboratory efficiency and the accuracy of results.

We provide a complete portfolio of laboratory filtration products that can be used across the wide range of brewing laboratory quality control applications, these include general filtration for de-gassing and removal of yeast, analytical chemical analysis of raw materials and final product, and microbiology analysis of spoilage organisms both in manufacturing, final product release and shelf-life studies.

This brochure highlights the key analytical applications used in the brewing process. We also give recommendations for which Cytiva filters are best suited for each application, ensuring quality and protecting taste.

The organizations referenced in this brochure are the American Society of Brewing Chemists (ABSC) and the Mitteleuropäische Brautechnische Analysenkommission (MEBAK).

Beer brewing workflow with key steps and ingredients highlighted



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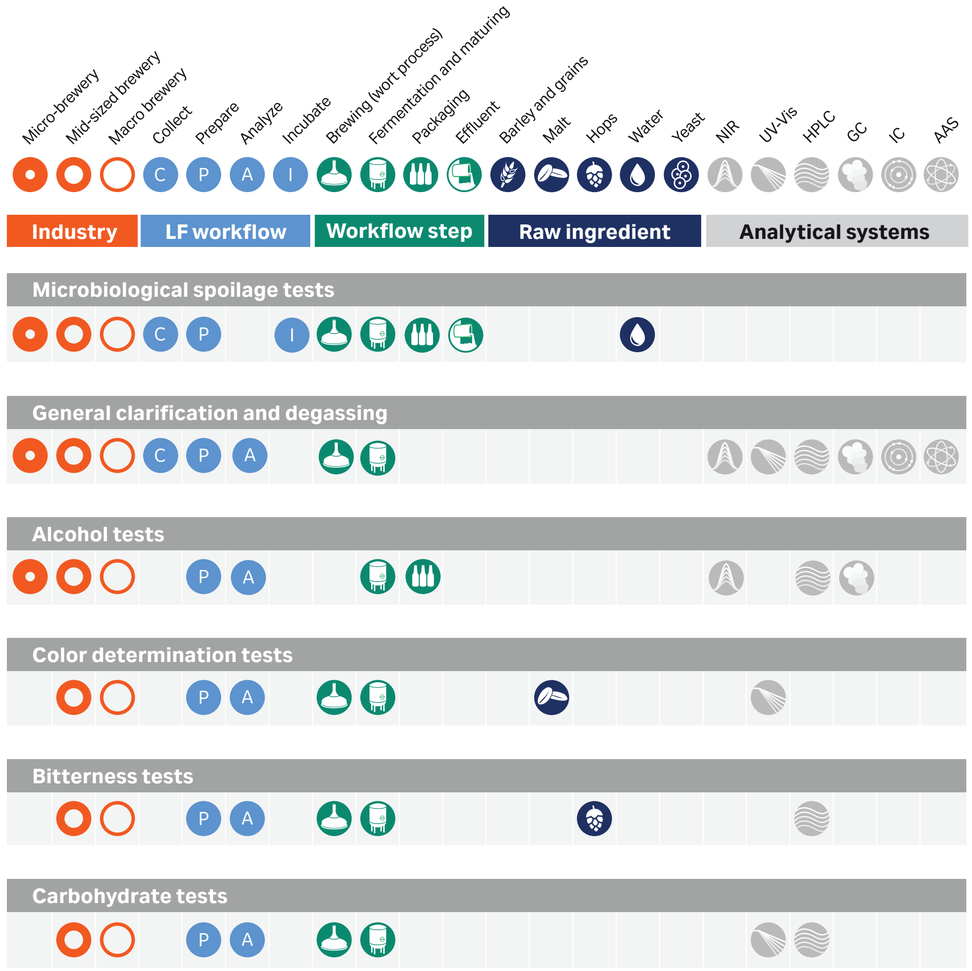
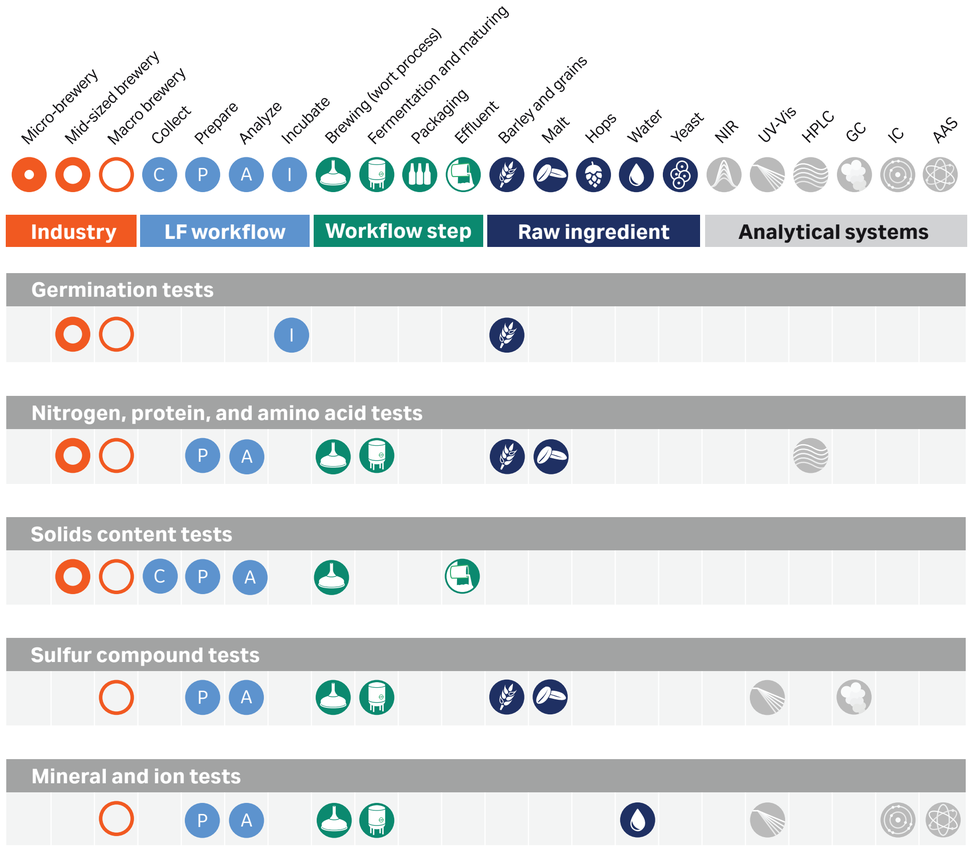
Malt
Barley
Water
Hops
Yeast

Key laboratory filtration application index

This table highlights key laboratory quality control tests used throughout brewing workflows. The table features applications in which filtration plays a critical role and the associated analytical systems used.





NIR = Near infrared spectroscopy, UV-Vis = Ultraviolet–visible spectroscopy, HPLC = High-performance liquid chromatography , GC = Gas chromatography, IC = Ion chromatography, AAS = Atomic absorption spectroscopy

General clarification and degassing tests

The degassing and clarification of wort and beer is a critical sample preparation step prior to many analytical methods. The presence of CO_2, turbidity, yeast, and other particulates can damage equipment and heavily affect results.

Fluted filter paper and funnel filtration

Passing the sample under gravity though a fluted paper filter in a funnel is a highly recommended method of clarifying and degassing wort, beer, and other samples for analysis.

Whatman Grade 2V pre-folded fluted papers have excellent particle retention and provide a high rate of particulate removal.

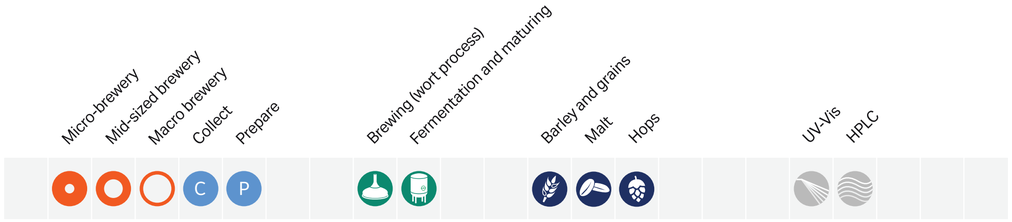
Whatman Grade 597½ provides a slightly lower rate of removal, but with a faster filter time. Papers are available in a variety of diameters and folded options.

Ordering information

Description	Quantity	Product code
Grade 2V fluted papers, 320 mm	100	1202-320
Grade 597½ fluted papers, 320 mm	100	10311853

Methods

ASBC #	Beer 1B
MEBAK #	2.9.1



Membrane vacuum filtration

Passing the sample though a membrane under vacuum is another method of clarifying and degassing wort and beer samples. It is recommended in methods where the removal of gases is important.

Whatman cellulose nitrate membranes have the strength and flexibility to allow excellent filtration of aqueous solutions. The membranes are available in a range of diameters and pore sizes.

We also offer a range of glass vacuum filtration devices and accessories.

Ordering information

Description	Quantity	Product code
Cellulose nitrate membrane discs, 0.45 µm, 50 mm	100	10401114

Methods

ASBC #	Beer 2, Beer 3, Beer 8, Beer 9, Beer 10, Beer 32, Beer 43
MEBAK #	2.20.1, 2.20.2, 2.21.3.2, 205.16.080

Filtration devices

Passing a smaller volume of sample through a filtration device is an alternative method of clarifying when a shorter preparation time is important.

Whatman GD/X™ syringe filters include a prefilter designed for filtering high particulate samples such as wort and beer. You also have the option to include a specific membrane filter within the device to save time on analytical preparation.

Whatman Autovials™ syringeless filters are preassembled, single-use, and contain the same filter capabilities as Whatman GD/X syringe filters. They can be used with hard to handle samples (such as hot wort).

Ordering information

Description	Membrane	Quantity	Product code
Whatman GD/X syringe filters	Glass prefilter, Glass microfiber, 0.45 µm	150	6894-1304
Autovial syringeless filters	Glass microfiber	50	AV125UGMF

Alcohol tests

In addition to knowing how strong a beer is, brewmasters rely on accurate alcohol determination is an to monitor fermentation rates and comply with legal regulations and alcohol taxation laws.

Degassing and clarification are important preparation steps before analysis. Common analytical systems used to measure alcohol content include near-infrared spectroscopy and gas chromatography.

Near-infrared spectroscopy sample preparation

Whatman Grade 2V pre-folded fluted papers are efficient at degassing and clarification.

Whatman Grade 597½ provides a slightly lower rate of particulate removal, but has a faster filtration time.

Papers are available in a variety of diameters and folded options.

Ordering information

Description	Quantity	Product code
Grade 2V, 320 mm	100	1202-320
Grade 597½, 320 mm	100	10311853

Methods

ASBC #	Beer 4G
MEBAK #	2.9.6.3

Gas chromatography sample preparation

Whatman Grade 4V pre-folded fluted papers have excellent degassing and filtration speed which is ideal for gas chromatography.

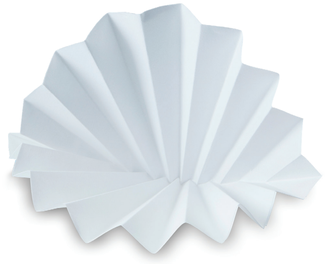
Papers are available in a variety of diameters and folded options.

Ordering information

Description	Quantity	Product code
Grade 4V, 320 mm	100	1204-320

Methods

ASBC #	Beer 4D, Beer 29



Microbiological spoilage tests

Although the antibacterial qualities of hops reduce growth of most microorganisms, some bacterial strains can reproduce and spoil the flavor and appearance of beer.

The most common method to determine the presence of these bacteria is to filter samples throughout the brewing process to isolate potential bacterial contamination, plate, then incubate in an anaerobic environment.

This method, commonly known as the membrane filter (MF) technique, allows for precise and accurate quantification of microorganisms in a liquid sample.

Membrane filters can be selected based on their pore size, allowing for the isolation of specific microorganisms. The method enables the quantification of microorganisms in a sample by counting the colonies that develop on the plated membrane filter.

The MF technique is applicable to a wide range of microorganisms, including bacteria, yeast, and fungi. This versatility makes it valuable in many microbiological analyses.

We offer a broad range of filters and hardware for use in microbiological quality control.

Membrane filtration

Our sterile membrane filters are designed and quality control tested for the concentration and recovery of microorganisms by the MF technique.

We offer a range of membrane type, color, and pore size to meet your testing needs. A 0.45 µm white membrane with black grid lines is the most common selection, but some light-colored organisms may show up better against a dark background, for example *Lactobacillus sp.* or *Pediococcus sp.* that are typically white or cream colored colonies.

Automatic membrane dispensers, such as the Sentino™ filter dispenser, provide one disc at a time by peeling open a continuous web of individually sealed discs. This results in an efficient workflow that maintains the integrity of results.

Ordering information

Description	Quantity	Product code
ME25 mixed cellulose ester membranes, 0.45 µm, 47 mm, white, gridded, gamma irradiated	1000	68121ME
Supor™ PES membranes, 0.2 µm, 47 mm, white, gridded, gamma irradiated	1000	68123
Metricel™ black PES membranes, 0.45 µm, 47 mm, black, gridded, gamma irradiated	1000	68124
Metricel black PES membranes, 0.8 µm, 47 mm, black, gridded, gamma irradiated	1000	68125
Sentino membrane dispenser	1000	13184

Methods

ASBC #	Microbiology 1D, 2B, 2C, 5

Sentino pump

The Sentino pump is a compact size, battery operated and portable, this pump is a smart choice for labs with limited space or sporadic samples.

Simple installation of the fluid path and peristaltic draw of fluid straight to waste collection provides efficient filtration and saves time in a busy lab. The Sentino pump is designed for versatility and can be used with any our filter funnel formats, including Microcheck™ beverage monitors.

Ordering information

Description	Quantity	Product code
Sentino pump	1	13186
Adapter with fluid path, gamma irradiated individually bagged for Microcheck beverage monitor	10	4861
Tubing 2 ft lengths, no adapters included	10	4285
Sentino magnetic filter funnel adapter, no tubing included	1	4283
Sentino filter funnel adapter, no tubing included	1	4872

Filter funnels for microbiological analysis

Microbiology workflows are different in each laboratory based on the number of samples to be processed, size of the laboratory, number of technical personnel, and risk of sample-to-sample cross contamination.

Reusable magnetic filter funnels are made of durable plastic, have a leak-free magnetic seal, and allow for a one-handed operation. Our magnetic filter funnels can withstand multiple autoclave cycles. To minimize waste and cleaning, the Sentino filter funnels (available in 100 and 250 mL sizes) are a good option for use with individual membrane filters.

For busy labs that need ready-to-use disposable filter funnels, Microcheck beverage monitors are available with white or black membranes. Simply place the funnel directly on your filter manifold. The funnels can convert to a petri dish for culturing or you can remove the membrane to place on a separate agar dish.

Ordering information

Description	Quantity	Product code
Sentino magnetic filter funnel, 150 mL	1/pkg	4271
Sentino magnetic filter funnel, 300 mL	1/pkg	4273
Sentino magnetic filter funnel, 500 mL	1/pkg	4277
Sentino filter funnel, 100 mL, 25/sleeve	100/pkg	4870
Sentino filter funnel, 250 mL, 20/sleeve	80/pkg	4871
Microcheck beverage monitor with ME25 MCE membrane, 0.45 µm, 47mm	50/pkg	4761ME
Microcheck beverage monitor with Metricel black PES membrane, 0.45 µm, 47mm	50/pkg	4763
Microcheck beverage monitor with Metricel black PES membrane, 0.8 µm, 47mm	50/pkg	4764

Microbiology manifold

A versatile and modular manifold is essential to laboratory efficiency. Our microbiology manifold has press-fit connections for simple assembly and easy disassembly for thorough cleaning and autoclaving.

We supply a selection of adapters to support all of our filter funnels. Sold in 3 place segments, use a coupling device to connect as many as 3 segments to double and triple your sample processing capabilities. Sturdy aluminum and stainless steel construction provides firm support for the 500 mL magnetic filter funnel. It is an ideal size for analyzing carbonated beverages and the additional funnel volume allows for foaming caused by off gassing of the sample.

Ordering information

Description	Quantity	Product code
3-place manifold, including: 3 valves, 1 end cap, 1 hose barb cap	1 set/pkg	4889
Microcheck filter funnel adapters	3/pkg	4890
Sentino filter funnel adapters	3/pkg	4891
Standard adapter	3/pkg	4892
Elongated standard adapter	3/pkg	4893
Coupling device	1/pkg	4893
Spare o-ring kit	1 set/pkg	4878
Manifold replacement valve	1/pkg	4894
Standard magnetic filter funnel 150 mL*	1/pkg	4247
Standard magnetic filter funnel 300 mL*	1/pkg	4242-N
Standard magnetic filter funnel 500 mL*	1/pkg	4238

*Order elongated standard adapter

Color determination

Color is an important measurement to monitor the brewing process and obtain a quality final beer with your desired color. The removal of particulates is a crucial sample preparation step prior to analysis either visually or by UV/Vis spectroscopic methods. Recommended methods involve passing beer and wort samples though a membrane under vacuum or glass fiber filter under gravity to obtain clear filtrate and accurate color.

Membrane vacuum filtration

Whatman cellulose nitrate membranes are designed for routine applications including the filtration of large amounts of aqueous solutions under vacuum. Membrane discs are available in a variety of diameters.

We also offers a range of vacuum filtration hardware.

(MEBAK recommended method)

Ordering information

Description	Quantity	Product code
Cellulose nitrate membrane discs, 0.45 µm, 50 mm	100	10401114

Methods

MEBAK #	2.12.1, 2.12.2

Glass fiber filtration

Whatman 934-AH™ glass microfiber filters are designed for fast and effective clarification of a large amount of aqueous solutions. The filter discs are available in a variety of diameters.

(ASBC recommended method)

Ordering information

Description	Quantity	Product code
934-AH glass microfiber filters, 320 mm	100	1827-320

Methods

ASBC #	Wort 9B

Bitterness tests

Bitterness is a key taste characteristic of beer. It can be measured across the brewing process to make decisions on hops, boiling times, and other additives to achieve desired taste.

The International Bitterness Units (IBU) measurement is derived from the concentration of α-acids, β-acids and isomerized versions in hops. These are measured by using a high-performance liquid chromatography (HPLC) system. We offer a variety of preparatory and analytical filter devices for HPLC applications.

Depending on nature of the mobile phase, different membranes are recommended.

Whatman nylon membranes are used to filter samples prior to HPLC of polar (hydrophilic) solvents.

Methods

ASBC #	Hops 9, Hops 14, Hops 15, Hops 16, Wort 23C
MEBAK #	2.17.3, 2.17.4

Whatman PTFE membranes are used for to filter samples prior to HPLC of non-polar (hydrophobic) solvents.

Methods

ASBC #	Beer 23E
MEBAK #	300.04, 311.02, 321.02, 321.03

HPLC sample preparation

Syringe device filters

Passing the clarified sample through a syringe filter prior to HPLC analysis is a highly recommended step. Whatman Puradisc™ syringe filters combine quality and economy for the quick and efficient filtration of samples.

Ordering information

Description	Membrane	Quantity	Product code
Puradisc 25	PTFE 0.45 µm	50	6750-2504
Puradisc 25	Nylon 0.45 µm	50	6784-2504

Syringeless filters

The Whatman Mini-UniPrep™ syringeless filter is a preassembled filtration device combining filtration membranes with an autosampler vial.

This all-in-one filtration process allows you to process samples in one-third of the time and reducing consumable costs by up to 40%.

Ordering information

Description	Membrane	Quantity	Product code
Mini-UniPrep syringeless filter	Nylon 0.45 µm	100	UN203NPUNYL
Puradisc 25	PTFE 0.45 µm	100	UN203NPUORG

High particulate filter devices

Whatman high particulate filtration devices combine the clarification of high particulate samples along with HPLC pre-filtering for a faster sample preparation time.

Whatman GD/X syringe filters are designed for filtering high particulate samples, along with the relevant solvent-compatible membrane.

Whatman Autovial syringeless filters are preassembled single use devices containing the same filter capabilities as Whatman GD/X syringe filters. They can be used with hard-to-handle samples (such as hot wort).

Ordering information

Description	Membrane	Quantity	Product code
Whatman GD/X syringe filters	Nylon 0.45 µm	150	6870-1304
Whatman GD/X syringe filters	PTFE 0.45 µm	150	6874-1304
Autovial 12	Nylon 0.45 µm	50	AV125UNAO
Autovial 12	PTFE 0.45 µm	50	AV125UORG

Carbohydrate tests

Carbohydrates, specifically sugars, influence the brewing process and beer quality.

They can be analyzed by UV/Vis spectroscopy and high-performance liquid chromatography (HPLC) methods. Clarification, degassing, and HPLC pre-filtering are all important sample preparation steps.

Clarification and degassing by filter paper

Passing the sample under gravity though a fluted paper filter in a funnel is a recommended method of clarifying and degassing wort, beer, and other samples for analysis.

Whatman Grade 2V pre-folded fluted papers have excellent particle retention and provide a high rate of particulate removal.

Ordering information

Description	Quantity	Product code
Grade 2V fluted papers, 320 mm	100	1202-320

Methods

ASBC #	Wort 22
MEBAK #	2.7.4, 2.10.3, 205.19, 205.20

Clarification and degassing by vacuum membrane filtration

Passing the sample though a membrane under vacuum is another method of clarifying and degassing wort and beer samples.

Whatman cellulose nitrate membranes have the strength and flexibility to allow filtration of aqueous solutions. The membranes are available in a range of diameters and pore sizes.

We offer the SolVac™ filter holder. The product has a versatile design that fits most HPLC bottles and containers, and eliminates the need to wash flasks and transfer mobile phase solvent from flask to reservoir.

Ordering information

Description	Quantity	Product code
Cellulose nitrate membrane discs, 0.45 µm, 50 mm	100	10401114
SolVac filter holder	1	4020

Methods

ASBC #	Wort 41B, Wort 19, Beer 41B, Sugars and Syrups 18
MEBAK #	2.7.2, 205.20

HPLC pre-filtration and sample preparation

Whatman nylon membrane are recommended to use in carbohydrate HPLC tests for pre-filtering prior to HPLC. (for Polar/hydrophilic solvents)

Whatman Puradisc syringe pre-filters combine quality and economy for the efficient filtration of samples.

Whatman GD/X syringe filters include a prefilter for high particulate samples along with a nylon membrane.

Whatman Mini-UniPrep is a preassembled filtration device, combining filtration membranes with an autosampler vial.

Ordering information

Description	Membrane	Quantity	Product code
Puradisc 25	Nylon 0.45 µm	50	6750-2504
Whatman GD/X syringe filters	Nylon 0.45 µm	150	6870-1304
Mini-UniPrep syringeless filter	Nylon 0.45 µm	100	UN203NPUNYL

Methods

ASBC #	Wort 19, Wort 22, Wort 41B, Sugars and Syrups 18
MEBAK #	2.7.2, 2.7.5, 205.19, 205.20

Barley germination tests

A barley sample's ability to germinate, or germinative energy, affects the quality of malt and the final beer in the brewing process.

Germinative energy tests involve incubating barley seeds on paper with constant water absorption. We have a range of pure cellulose papers options with no additives that can be used for seed testing.

Seed testing papers

Whatman seed testing papers are designed for seed germination with a constant absorption of water. There are no additives that could influence germination.

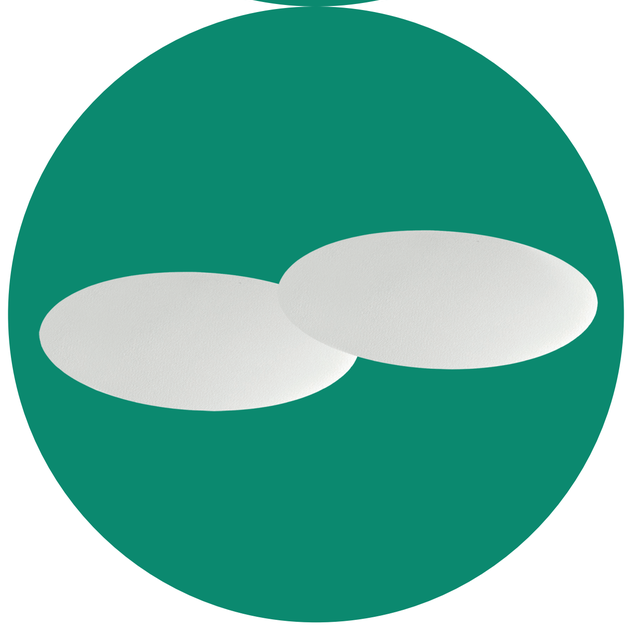
Seed testing papers are available in a variety of sizes, absorption grades, pleated strips, petri dish circles, sheets, and colors.

Ordering information

Description	Quantity	Product code
Grade 1 filter paper circle, 85 mm, white	100	1001-085
Seed testing paper, grade 3621, 140 × 200 mm sheet, white	1000	10342580
Seed testing paper, grade 3644, 380 × 340 mm sheet, white	100	10342582
Seed testing paper, grade 3014, 110 × 20 mm pleated, white	1000	10344672

Methods

ASBC #	Barley 3
MEBAK #	110.27, 110.29, 110.30, 110.32, 110.33, 110.34, 110.35



Nitrogen and protein tests

Nitrogen compounds and protein levels are significant factors in yeast metabolism, final beer shelf life, mouth feel, and foam stability. A recommended test method is by Kjeldahl analysis. Be sure to use specialty filter papers and weighing boats with low nitrogen content to avoid influencing the test results.

Filter paper filtration

Whatman Grade 589/2 quantitative ashless papers are designed for the preparatory filtration of wort and beer samples prior to analysis. They have a low nitrogen content and will not influence analytical results. The papers are available in a variety of diameters and pre-folded options.

Ordering information

Description	Quantity	Product code
Grade 589/2, 320 mm	100	10300120

Methods

ASBC #	Wort 10 A&B, Beer 11A
MEBAK #	2.6.2, 2.6.3.1, 2.6.3.2, 205.13.030

Weighing boats

Whatman Kjeldahl weighing boats are an easy way to transfer barley and malt samples by dropping the entire boat and contents loss-free into the acid solution. They are made from a very low nitrogen parchment paper, and will not influence analytical result. The boats are available in a variety of sizes and sheet options.

Ordering information

Description	Quantity	Product code
Weighing boats, 55 × 10 × 10 mm	100	10313032

Methods

ASBC #	Barley 7A, Malt 8, Cereals 6
MEBAK #	2.6.1.1, 110.41.030, 205.11.030

Suspended solids content tests

The brewing process often generates large amounts of wastewater effluent which needs to be treated or disposed off according to regulations set by government bodies.

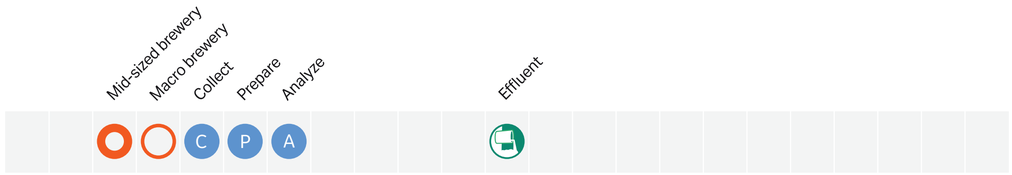
Total suspended solids (TSS) is measured by mass loss to calculate the total solids (TS) content of wastewater.

There are various global standards that outline the method and specified filter features. Although most countries have their own testing methods, they are likely based on existing standards by either the European Committee for Standardization (CEN) or the United States Environmental Protection Agency (EPA).

We offer various glass fiber filter grades designed for TSS testing that follow parameters set out in these standards.

Key standards

Description	Quantity	Product code
Committee	EN 872	GF/C™
EPA	2540 D	934-AH™

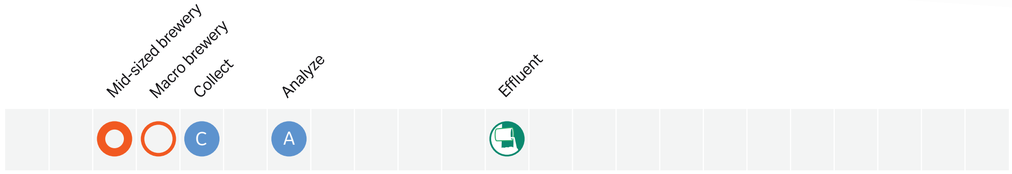


Glass fiber paper filters

Whatman glass fiber paper discs feature a high flow rate, fine retention capacity, and stability up to 550°C. They are designed for TSS analysis of wastewater and effluent by the mass loss method.

Ordering information

Description	Quantity	Product code
GF/C glass microfiber discs, 47 mm	100	1822-047
934-AH™ glass microfiber discs, 47 mm	100	1827-047



RTU (Ready-to-use) glass fiber filters

Whatman glass 934-AH RTU filters are delivered pre-washed and pre-weighed, eliminating preparatory steps prior to filtration of the wastewater sample.

The filters are in full compliance with Method 2540D (USA), and save time by eliminating five steps from the filtration process.

RTU filters are available in additional grades, including GF/C.

Ordering information

Description	Quantity	Product code
GF/C RTU glass microfiber discs, 47 mm	100	9907-042
934-AH RTU glass microfiber discs, 47 mm	100	3822-047

Sulfur compound tests

Several sulfur compounds can form throughout the brewing process. These can serve as antioxidants, but can cause off-flavors in beer.

Sulfur dioxide is a by-product of yeast, and, it can be detected by UV/Vis spectroscopy (preparatory filtration is required).

Dimethyl sulfide (DMS) is formed from heating wort. It is detected by head space gas chromatography and preparatory filtration is required.

Near-infrared spectroscopy sample preparation

Whatman Grade 2V pre-folded fluted papers have excellent degassing and clarification rates.

Papers are available in a variety of diameters and folded options.

Ordering information

Description	Quantity	Product code
Grade 2V, 320 mm	100	1202-320

Methods

ASBC #	Malt 11, Beer 23B
MEBAK #	2.21.8.1, 2.21.8.3

DMS test filtration

Whatman Grade 1V pre-folded fluted papers have excellent degassing and clarification rates.

Papers are available in a variety of diameters and folded options.

Ordering information

Description	Quantity	Product code
Grade 1V, 320 mm	100	1201-320

Methods

ASBC #	Malt 11, Beer 23B
MEBAK #	00.29.153, 2.23.11

Mineral and ion tests

The properties of water have a significant impact on the brewing process. Various dissolved minerals, ions, compounds, and trace metals can make a huge difference in the final taste of the beer.

The content and concentration of these trace elements can be tested and measured throughout the brewing process by ion chromatography (IC) and atomic absorption spectroscopy (AAS).

We offer a range of specialized filter paper and devices to use for the filtration of samples prior to analysis.

IC analytical filtration

The minerals and ion content of brewing water can be detected by the use of IC.

Whatman Anotop™ IC syringe filters are specially designed for the analytical prefiltering of clarified IC samples with very low levels of anion leaching.

Ordering information

Description	Membrane	Quantity	Product code
Anotop 25 IC syringe filters, 0.2 µm	Anopore	200	6809-9244

IC anion membrane vacuum filtration

The clarification of wort and beer samples is an important preparatory filtration step prior to IC.

Whatman nylon membranes are suitable for preparatory vacuum filtration for the testing of chloride, sulphate, nitrate and phosphate content.

We also offer a range of glass vacuum filtration devices and accessories.

Ordering information

Description	Quantity	Product code
Nylon membrane discs, 0.45 µm, 50 mm	100	7404-002

Methods

ASBC #	Beer 43
MEBAK #	2.22.1

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For local office contact information, visit cytiva.com/contact

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