

## User Guide

# Stainless Steel 90 mm Filter Holder

YY3009000

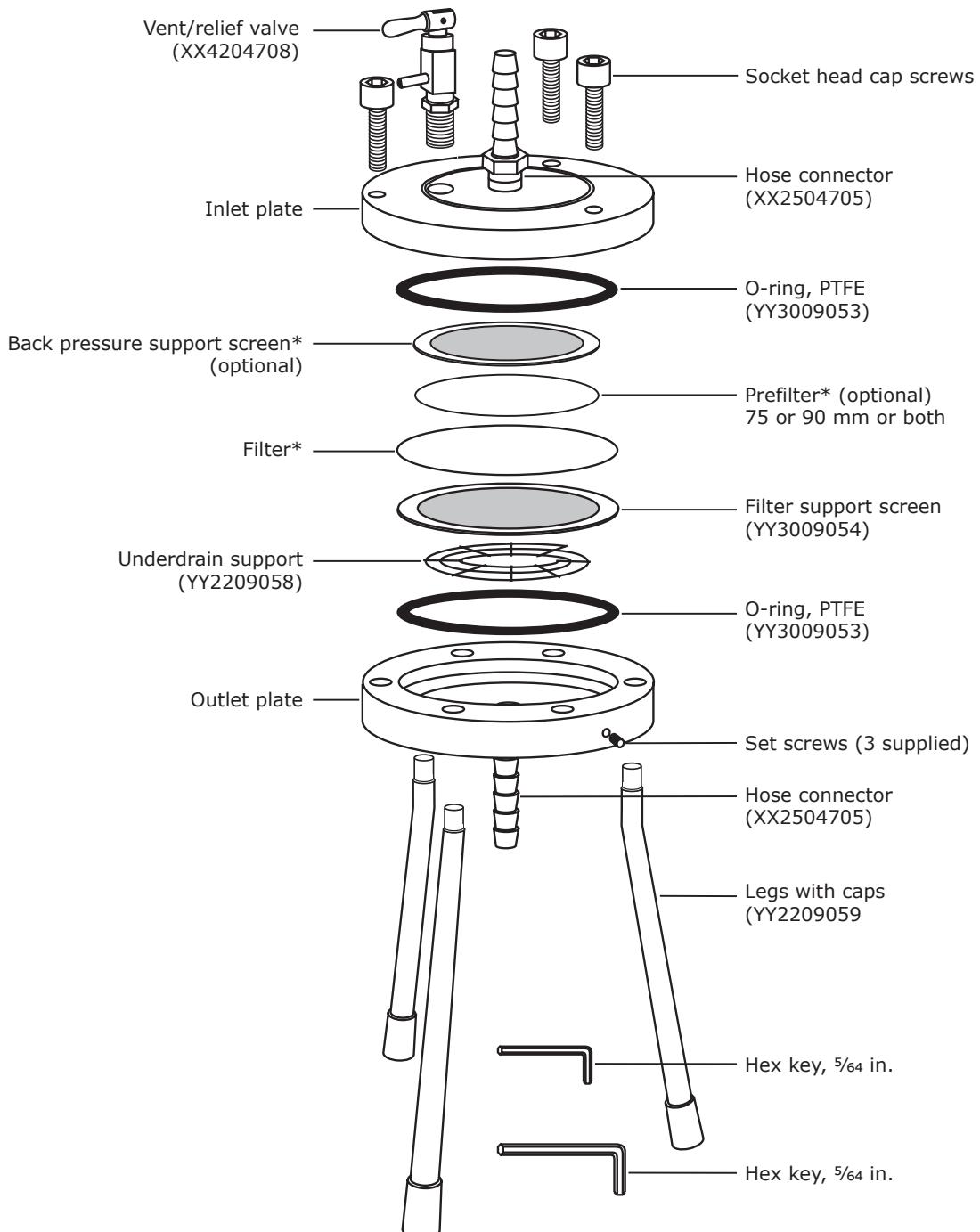


## Introduction

The 90 millimeter (mm) Stainless Steel Filter Holder is designed to clarify/sterilize liquids or gases by pressure filtration through a 90 mm diameter filter. To increase throughput, a 90 mm prefilter or a 75 mm depth-type prefilter (or both) can be placed upstream of the final filter. Polytetrafluoroethylene (PTFE) sealing surfaces allow the filter holder to be autoclaved with the filter in place.

This user guide provides instructions on how to clean, assemble, load, and check the integrity of the filter system before use. For sterilizing filtration applications, the filter holder needs to be cleaned and autoclaved before use.

## 90 mm Stainless Steel Filter Holder Assembly Diagram



\* Order separately (see Ordering Information section)

## Disassembling and Cleaning the Filter Holder Before Use

1. Using the  $\frac{5}{16}$  in. hex key, remove the three socket head cap screws.
2. Lift off the inlet plate, and place it upside down on the laboratory bench.  
**CAUTION:** To avoid contamination, do not place the inlet plate on the bench with the O-ring side down.
3. Tilt the outlet plate until the filter support screen and underdrain support slide out.  
**CAUTION:** To avoid damaging the support screen mesh, do not pry the support screen out of the filter holder.
4. Using smooth-tip forceps, gently pry the O-rings out of the inlet and outlet plates by inserting the forceps into the small rounded "O-ring pick-out" recess.
5. If the filter holder has been used previously, remove the vent valve and hose connectors and remove the PTFE tape from the threads.
6. Clean components (including hose connectors and vent valve) with a sponge, hot water, and a non-abrasive cleanser. Clean threaded parts, recesses, and orifices with a stiff bristle brush.  
**CAUTION:** To avoid component damage, never use steel wool or abrasive materials on any part of the holder. Take particular care not to scratch the PTFE side of the filter support screen.
7. Rinse all components thoroughly with hot running tap water, followed by two cold-water rinses. Use laboratory-grade water for the final rinse.
8. Allow components to air dry while disassembled.

**CAUTION:** Do not wipe dry with paper or cloth, as this leaves fibers and lint on the surfaces and also generates electrostatic forces that can attract more dirt. Filtered compressed air can be used to facilitate drying.

## Assembling the 90 mm Filter Holder

1. Wrap the vent valve's exposed threads with PTFE (e.g. Teflon™) tape. Install the vent valve on the top of the inlet plate and tighten with a wrench.
2. Wrap the exposed threads of the hose connectors with PTFE tape.
3. Install the hose connectors on the bottom of the outlet plate and on the top of the inlet plate and tighten with a wrench.
4. Insert the legs into the bottom of the outlet plate, then insert the set screws that secure the legs and tighten with the  $\frac{5}{64}$  in. hex key. Stand the assembly upright.
5. Replace the O-rings in the inlet and outlet plates by pressing them gently into their grooves without rolling or stretching.
6. Place the underdrain support (spiral ring facing up) in the outlet plate and place the filter support screen (PTFE side up) on top of the underdrain support.

## Loading the Filter Holder

1. Use forceps to remove a 90 mm diameter filter from its package. Load the filter so that the side facing up in the package is the side facing up in the holder.
2. Center the filter on the support screen. If using a 90 mm prefilter to extend the life of the final filter, center it on top of the final filter. A 75 mm depth-type prefilter can be added in place of or in addition to the 90 mm prefilter. The 75 mm prefilter will sit inside the O-ring, and needs to be centered so that it does not obstruct the sealing O-ring.
3. If required, center the 76 mm diameter back pressure support screen (YY4007664) on top of the prefilter. This protects the membrane filter against reverse flow surges. Do not place the back pressure support screen on top of a final filter. To ensure proper filtration, you must use a prefilter when you use the back pressure support screen.
4. Align the three screw holes in the inlet plate with the corresponding threaded holes in the outlet plate. Then place the inlet plate on the outlet plate so that the sealing O-ring rests on the filter.

**CAUTION:** Do not shift the inlet plate once contact has been made, as this may damage the filter. If the hole alignment is inaccurate, lift the inlet plate straight up, make the necessary correction, then lower it again.

5. Insert the socket head cap screws through the clearance holes. Hand tighten all cap screws. Then tighten equally with the hex key supplied.

**NOTE:** When autoclaving the filter holder with the filter in place, hand tighten the cap screws, but do not tighten with a hex key until after the filter holder has been removed from the autoclave and allowed to cool.

6. Attach an appropriate length of  $\frac{3}{8}$  in. ID tubing to the inlet and outlet hose connectors and clamp them.
7. If autoclaving the filter holder, refer to the next section. If not, skip to the Connecting the Inlet and Outlet Connectors section.

## Autoclaving the Filter Holder

When autoclaving with the filter in place, it is important that the steam be able to access both sides of the filter at the same time, so that there is no differential pressure across the filter, especially while it is hot. To ensure that there are no flow restrictions on the filter holder inlet and outlet, make sure that all valves are fully opened and that tubing (if attached) is not kinked. If tubing ends are wrapped, use wrapping material that breathes freely.

Make sure that any tubing used is autoclavable and can withstand the maximum filtering pressure.

**NOTE:** Outlet tubing length should not exceed 1.2 meters (4 ft). If autoclaving the inlet tubing at the same time, it should be no longer than the outlet tubing.

If you are using a filtrate receiving vessel that has a vent, you can attach it to the outlet tubing and autoclave it with the holder (make sure vent is open/unobstructed). Otherwise, install a fitting on the end of the outlet tube that can be aseptically attached to the vessel.

1. Wrap the exposed ends of tubing or connectors with lint-free autoclave paper to exclude contamination while allowing passage of steam. Fasten the paper with rubber bands or autoclave tape.
2. Open all vent valves (handle up), wrap with lint-free autoclave paper, and open the flow control valves. Autoclave at 121 °C and 1 bar (15 psi) for 35 to 45 minutes, or until the system is sterile.
3. At the end of the autoclave cycle, exhaust the autoclave slowly to prevent the filter from rupturing.
4. Tighten the cap screws with the hex key after the holder has cooled.

## Connecting the Inlet and Outlet Connectors

**NOTE:** If the system has been autoclaved, use aseptic technique.

1. Using a control valve that can withstand the maximum filtering pressure (refer to the Specifications section), attach the filter holder inlet connector to the outlet of the unfiltered liquid supply.
2. Clamp the connections.
3. Attach the filter holder outlet connector to the inlet of the receiving vessel with suitable tubing.
4. Clamp the connections.

**NOTE:** To permit a bubble test of the system integrity, the receiving vessel or a section of the outlet tubing should be transparent.

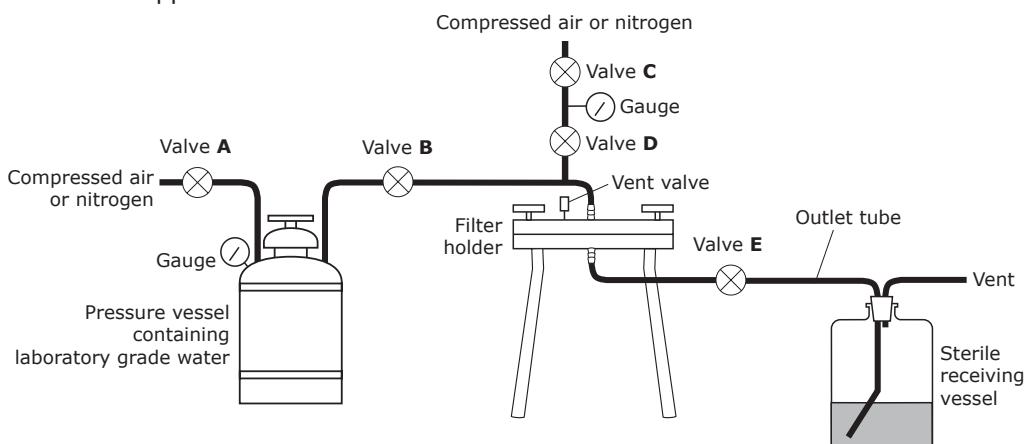
5. Attach an appropriate length of 1/4 in. transparent tubing to the outlet nipple on the filter holder vent valve.
6. Place the free end of this tubing into a drain/waste container.
7. If a system integrity test is not required, skip to the Filtering the Sample section.

## Checking System Integrity (Optional)

An in-process bubble point test can be performed before or after filtering solutions. It will detect damaged membrane, ineffective seals, system leaks, and distinguish filter pore size. During a very simple in-process bubble point test, low pressure (e.g., 0.3 bar or 5 psi) from a compressed air or nitrogen source forces liquid from a pressure vessel through an assembled filter holder to fully wet the membrane filter. Once all the liquid has been passed through the membrane filter, gas is in contact with the filter surface. The pores of the membrane filter and the downstream tubing are still full of water. The gas pressure is increased and when the applied pressure reaches the bubble point pressure of the filter, liquid is displaced from the filter pores, and a continuous stream of gas bubbles is released. The system is integral (filter intact and holder properly sealed) if no bubbling occurs at a pressure less than the filter bubble point value.

### Setup

The complexity of the integrity test system can vary depending on the application, and the user will need to provide the appropriate gauges, valves, connectors, and tubing. The following figure shows a more complex setup, with isolating valves that allow wetting out of the filter and application of pressure for the bubble point determination to occur independently without taking the system apart. With the sealed receiving vessel, this configuration is appropriate for a sterilizing application. The Bubble Test Apparatus (XX6700L55) can simplify the integrity test system by eliminating the need for a second compressed air/nitrogen line. Fewer valves and an open receiving vessel may suffice for a non-sterile application.



**NOTE:** Filter holder outlet tube or receiving vessel must have a clear portion in order to determine when the bubble point has been reached.

## Integrity Test

For more detail on bubble point integrity testing, refer to publication TB039, "Filter Integrity Test Methods" at [SigmaAldrich.com](https://SigmaAldrich.com) (enter TB039 in the search box).

**CAUTION:** Do not perform this test for membrane filters whose bubble point is higher than the maximum differential pressure of the filter holder.

1. Before performing the integrity test, determine the typical bubble point and appropriate wetting solution for the filter you are using. Go to [SigmaAldrich.com](https://SigmaAldrich.com) and enter the family name (Durapore®, MF-Millipore™, Fluoropore®, etc. + membrane filters) in the search box.
2. Close valves B, C, D, and E. Open valve A and filter holder vent valve.
3. Apply 5 psi pressure to pressure vessel containing laboratory grade water (or alcohol for hydrophobic membranes).
4. Open valve B and allow liquid to enter the filter holder slowly. When all the air has been displaced from the interior of the holder, liquid will start to flow through the vent valve.
5. Close the filter holder vent valve and open valve E. Allow approximately 500 mL of liquid to filter through and thoroughly wet out the filter.
6. Close Valves A and B.
7. Open valve C and apply low pressure (5 psi). Open valve D. Filtered liquid will flow from the filter holder outlet until all liquid has been forced out of the upstream portion of the holder.
8. Maintain this pressure. If the pressure exceeds 5 psi, use the vent valve on the filter holder to reduce the pressure to 5 psi.

**NOTE:** When all of the upstream liquid has passed through the filter, the flow will stop. A rapid continuous flow of gas exiting the downstream outlet tubing indicates inadequate wetting, filter failure, or incomplete sealing. Close valves C and D to turn the pressure off and relieve the pressure in the system by slowly opening the vent valve. Return to step 2 and repeat the procedure to ensure that the membrane is fully wet out. If the same thing happens, disassemble the system, inspect membrane for damage and ensure that there is no dirt, debris, or damage to the O-rings.

9. If there is no rapid continuous flow of gas on the downstream side of the filter holder, increase the pressure slowly to approximately 80% of the typical bubble point.
10. Continue to increase the pressure gradually in 5 psi increments, pausing 10–15 seconds after each increase.
11. Watch for a steady, continuous stream of gas (bubbles) exiting the downstream outlet tubing (not just a few intermittent diffusion bubbles) and note the pressure at which this occurs.
12. The test is successful if you have reached or exceeded the typical bubble point. A bubble point lower than typical is an indication of one of the following:
  - Non-integral membrane or seal
  - Incompletely wetted membrane
  - Fluid with different surface tension than the recommended test fluid
  - Integral filter, but wrong pore size
  - High temperature
13. Close valves C and D. Relieve the pressure in the system by slowly opening the vent valve on the filter holder. Keep the valve open until the pressure gauge reads 0.

**NOTE:** If the holder contains multiple filters (as in a serial filtration), or a prefilter in addition to the membrane filter, gas trapped against the wet membrane after a bubble point test can produce an air-lock that will restrict flow. You can overcome this by raising the filtering pressure over the bubble point of the smallest pore size filter used. This difficulty is avoided if the application allows a deferred bubble point test after filtration is complete.

## Filtering the Sample

**CAUTION:** Do not exceed the maximum inlet pressure of 19 bar (275 psi) or the differential pressure of 5.2 bar (75 psi).

1. Connect the vessel containing the unfiltered liquid.
2. With the filter holder vent valve open, pressurize the vessel and allow the liquid to slowly enter the filter holder.
3. When the liquid emerges from the vent valve, close the vent valve, and increase the flow rate to the appropriate operating level. Start filtration at a low pressure so that it can be increased to maintain a satisfactory flow rate when the filter starts to plug.
4. Continue filtration until all of the unfiltered supply has passed through the system and into the receiving vessel.
5. Apply gas or filtered air pressure through the filter holder inlet to recover liquid in the upstream portion of the holder. Liquid upstream of the filter will be pushed through, adding to the filtered volume.

## Specifications

### Maximum pressure

Inlet	19 bar (275 psi) with preset vent valve supplied
Differential	5.2 bar (75 psi)

<b>Filter diameter</b>	90 mm
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<b>Prefilter diameter</b>	90 mm (membrane prefilter) or 75 mm (thick depth prefilter)
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<b>Effective filter area</b>	Approximately 51.2 cm <sup>2</sup> (7.9 in. <sup>2</sup> )
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### Connections

Inlet and outlet adapters	1/4 in. (8 mm) female national pipe thread (FNPT) to hose connector for 3/8 in. (9.5 mm) ID tubing
Upstream vent valve port	1/8 in. (6 mm) FNPT

### Dimensions

Diameter	Filter holder 12.1 cm (4.75 in.)
Footprint	18.3 cm (7.2 in.)
Height	23.6 cm (9.3 in.), including inlet connector

<b>Weight</b>	2.5 kg (5.5 lb)
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### Materials of construction

Inlet plate, outlet plate, hose connectors, underdrain support	316 stainless steel
Socket head cap screws	410 stainless steel
Support screen	PTFE-coated (one side) 316 stainless steel
O-rings	PTFE
Vent/relief valve	316 stainless steel, fluoroelastomer
Filter holder legs	Anodized aluminum with vinyl caps

## Statement Regarding Compliance with the Pressure Equipment Directive, 2014/68/EU

We certify that this product complies with the European Pressure Equipment Directive, 2014/68/EU of 15 May 2014. This product is classified under Article 4 § 3 of the Pressure Equipment Directive. It has been designed and manufactured in accordance with sound engineering practices to ensure safe use. The product is accompanied by user instructions and bears markings to permit identification us as the manufacturer or authorized representative of this product within the European Community. In compliance with Article 4 § 3 of the Pressure Equipment Directive, this product does not bear the CE mark.

## Product Ordering Information

Purchase these products online at [SigmaAldrich.com](https://SigmaAldrich.com).

Description	Catalogue Number
Stainless Steel 90 mm Filter Holder	YY3009000
<b>Replacement Parts</b>	
Hose connector, 1/4 in. (8 mm) male NPT to 3/8 in. (9.5 mm) ID hose (1/pk)	XX2504705
Vent/relief valve, 19 bar (275 psi) (1/pk)	XX4204708
Filter support screen, PTFE-coated one side (1/pk)	YY3009054
Underdrain support (1/pk)	YY2209058
Legs with caps (3), set screws (3), 5/64 in. hex key (1)	YY2209059
O-ring, PTFE (4/pk)	YY3009053
<b>Accessories</b>	
Filter forceps, stainless steel, blunt end (3/pk)	XX6200006P
PVC tubing (not autoclavable), 3/8 in. (9.5 mm) ID x 5/8 in. (15.9 mm) OD, 3 m (10 ft), with 2 stainless steel clamps	XX6700034
Filter support screen, stainless steel, 90 mm (1/pk)	YY2209064
Back pressure support screen, stainless steel, 76 mm (1/pk)	YY4007664
Dispensing Pressure Vessel, (ASME code-complying, 5-liter capacity)	XX6700P05
Bubble Test Apparatus	XX6700L55

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