

PORE FILTRATION

THE COMPLETE GUIDE TO

INDUSTRIAL FILTER HOUSINGS

Everything You Need to Know
About Stainless Steel Filter Housings,
Cartridge Housings, Bag Filter Vessels
and Industrial Filtration Systems



BUILT TO PERFORM

High quality stainless steel construction for reliable performance



WIDE RANGE

Single, multi-cartridge and bag filter housings to suit any application



DESIGNED FOR INDUSTRY

Robust, pressure-rated designs for demanding industrial environments



EASY MAINTENANCE

User-friendly design for quick access and simple filter replacement

TYPICAL APPLICATIONS



WATER
TREATMENT



FOOD &
BEVERAGE



PHARMACEUTICAL
MANUFACTURING



CHEMICAL
PROCESSING



PAINTS &
COATINGS



GENERAL
INDUSTRIAL

**CLEANER LIQUIDS.
BETTER PERFORMANCE.**



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Introduction

A filter housing is far more than simply a vessel that holds a filter cartridge or filter bag. It forms the foundation of every industrial filtration system, providing the pressure containment, sealing integrity and mechanical support necessary for safe and reliable operation.

Whether filtering purified water for pharmaceutical manufacture, removing contaminants from food ingredients, protecting process equipment in chemical plants or clarifying industrial process liquids, selecting the correct filter housing is just as important as choosing the filter element itself.

An incorrectly specified housing can reduce filtration efficiency, increase maintenance requirements, create bypass leakage or fail to meet pressure and hygiene requirements.

Modern filter housings are available in numerous configurations, materials and pressure ratings to suit everything from small laboratory systems to large industrial processing plants handling hundreds of cubic metres of liquid per hour.

This guide explains the different types of industrial filter housings, their construction, pressure ratings, design standards, hygienic considerations and how to select the correct housing for your application.

What is a Filter Housing?

A filter housing is a pressure vessel designed to contain one or more filter elements while directing process fluid through the filtration media. The housing ensures that all liquid or gas passes through the filter without bypassing the element.

A typical housing consists of:

- Pressure vessel body
- Removable lid or closure
- Filter support plate
- Cartridge or bag location points
- Inlet connection
- Outlet connection
- Vent valve
- Drain valve
- Sealing O-ring or gasket
- Mounting legs or brackets (where applicable)

Industrial housings are designed to withstand continuous operating pressures while allowing quick access for routine filter replacement.

How Filter Housings Work

Although housings vary in design, their operating principle remains largely the same. Contaminated liquid enters the housing through the inlet connection, is directed towards the filter element where contaminants are removed, and clean liquid exits through the outlet connection before continuing downstream.

PROPER HOUSING DESIGN ENSURES

- Even flow distribution
- Minimal pressure loss
- Secure filter sealing
- No liquid bypass
- Safe pressure containment

Most housings also incorporate vent and drain ports to simplify commissioning, vent trapped air and allow complete drainage during maintenance.

Why Filter Housing Selection Matters

Choosing the correct housing affects every aspect of filtration performance.

A PROPERLY SPECIFIED HOUSING PROVIDES

- Reliable sealing
- Consistent filtration efficiency
- Safe operation
- Easy maintenance
- Long equipment life
- Regulatory compliance
- Lower operating costs

AN UNSUITABLE HOUSING CAN RESULT IN

- High pressure drop
- Difficult maintenance
- Premature filter blockage
- Increased energy consumption
- Product contamination
- Reduced production efficiency

Stainless Steel Filter Housings

Stainless steel is the preferred construction material for the majority of industrial filter housings due to its excellent corrosion resistance, mechanical strength and hygienic properties. The two most common grades are 304 stainless steel and 316L stainless steel.

304 Stainless Steel

304 stainless steel provides excellent corrosion resistance for many industrial applications and offers an economical solution where highly aggressive chemicals are not present.

TYPICAL APPLICATIONS

- General water filtration
- Cooling water
- Process water
- Food production
- Brewing
- HVAC systems

ADVANTAGES

- Good corrosion resistance
- Excellent mechanical strength
- Cost-effective
- Easy to clean
- Long service life

316L Stainless Steel

316L stainless steel contains added molybdenum, providing significantly improved resistance to chlorides, aggressive chemicals and corrosion. It is widely specified for demanding hygienic and chemical processing applications.

TYPICAL APPLICATIONS

- Pharmaceutical manufacture
- Biotechnology
- High-purity water
- Food processing
- Beverage production
- Chemical processing
- Cosmetics

ADVANTAGES

- Superior corrosion resistance
- Excellent hygienic properties
- High mechanical strength
- Suitable for CIP and SIP
- Long service life
- Excellent weldability

Because of its superior corrosion resistance, 316L is the most common material used in sanitary filter housings.

Single Cartridge Filter Housings

Single cartridge housings are designed to accommodate one filter cartridge and are commonly used in lower-flow applications or where space is limited. They are available in lengths including 5", 10", 20", 30" and 40" depending on the cartridge type.

TYPICAL CARTRIDGE STYLES

- DOE (Double Open End)
- 222 O-ring
- 226 O-ring
- Fin-end
- Code 7
- Code 8

APPLICATIONS

- Laboratories
- Pilot plants
- Point-of-use filtration
- Beverage dispensing
- Water treatment
- OEM equipment
- Small production lines

ADVANTAGES

- Compact design
- Low installation cost
- Simple maintenance
- Easy cartridge replacement
- Suitable for low flow rates
- Wide cartridge compatibility

Because only one cartridge is installed, maintenance is quick and replacement costs remain low.

Multi-Cartridge Filter Housings

Where higher flow rates are required, multi-cartridge housings provide a practical and economical solution. These vessels accommodate multiple cartridges operating in parallel.

TYPICAL CONFIGURATIONS

- 3 cartridge
- 5 cartridge
- 7 cartridge
- 12 cartridge
- 18 cartridge
- 24 cartridge
- 36 cartridge
- 52 cartridge
- 60 cartridge

Some custom industrial vessels can accommodate even larger cartridge quantities.

How Multi-Cartridge Housings Work

Incoming liquid is distributed evenly across all installed cartridges. This provides:

- Higher total flow capacity
- Lower pressure drop
- Longer cartridge life
- Better contaminant distribution

Because the total flow is shared between multiple cartridges, each filter experiences lower individual loading. This significantly increases operating efficiency.

ADVANTAGES

- High flow rates
- Reduced pressure loss
- Longer service intervals
- Lower maintenance frequency
- Suitable for continuous production
- Reduced operating costs

Multi-cartridge housings are commonly used in pharmaceutical manufacturing, food production, water treatment and chemical processing where uninterrupted operation is essential.

Cartridge Housing Configurations

Cartridge housings are available in several configurations depending on the application.

Vertical Housings

The most common design. Advantages include:

- Compact footprint
- Excellent drainage
- Easy cartridge replacement
- Good venting

Horizontal Housings

Used where installation height is restricted. Common in marine applications, skid-mounted systems and compact process equipment. Although less common than vertical vessels, horizontal housings can provide excellent accessibility where overhead clearance is limited.

Bag Filter Housings

Bag filter housings are specifically designed to accommodate liquid filter bags and are widely used in applications requiring high flow rates and excellent dirt-holding capacity.

Unlike cartridge housings, which typically contain pleated or depth filter cartridges, bag filter housings support flexible filter bags using an internal support basket. The basket prevents the bag from collapsing under pressure while ensuring even flow distribution across the filtration media.

TYPICAL OPTIONS

- Single bag housings
- Duplex bag housings
- Multi-bag housings
- Top-entry designs
- Side-entry designs

Single Bag Filter Housings

Single bag housings are ideal for lower flow applications and installations where space is limited. They are commonly used in:

- Water treatment
- Food production
- Chemical dosing systems
- Paint manufacturing
- Cooling water systems
- OEM process equipment

ADVANTAGES

- Compact footprint
- Lower capital cost
- Easy maintenance
- Quick bag replacement
- Suitable for flow rates up to approximately 20–40 m³/hr (depending on bag size and fluid properties)

Multi-Bag Filter Housings

Where higher flow rates are required, multi-bag housings provide a highly efficient solution. These vessels contain several filter bags operating in parallel, dramatically increasing total flow capacity while reducing pressure drop. Typical configurations include 2, 4, 6, 8, 12, 16 and 24 bag vessels.

ADVANTAGES

- High flow capacity
- Reduced pressure loss
- Longer filter life
- Lower maintenance frequency
- Suitable for continuous industrial processes

Multi-bag systems are frequently installed in chemical plants, municipal water treatment facilities and large food production sites.

Pressure Ratings

Every filter housing is designed to operate safely within a specified pressure range. Selecting a housing with the correct pressure rating is essential for safe operation, regulatory compliance and long-term reliability.

The maximum allowable working pressure (MAWP) is determined by factors including housing material, wall thickness, closure design, seal arrangement, temperature and design code. Typical operating pressure ratings include:

Housing Type	Typical Pressure Rating*
Plastic Housings	Up to 6 bar
Standard Stainless Steel Housings	10 bar
Heavy-Duty Industrial Housings	16 bar
High-Pressure Filter Vessels	20–40 bar or higher

*Actual pressure ratings vary by manufacturer and design specification. The allowable operating pressure decreases as operating temperature increases. Always consult the manufacturer's pressure/temperature ratings before installation.

Differential Pressure

In addition to the housing's maximum working pressure, operators should monitor the differential pressure across the filter element. Excessive differential pressure can lead to:

- Reduced flow rates
- Premature filter blockage
- Increased energy consumption
- Damage to filter elements

Routine monitoring helps determine the optimum time for filter replacement while maintaining efficient system operation.

Sanitary Filter Housings

Sanitary, or hygienic, filter housings are specifically designed for industries where cleanliness, sterility and product purity are essential. Unlike standard industrial housings, sanitary housings feature smooth internal surfaces, crevice-free construction and hygienic connections that minimise the risk of bacterial growth and product contamination. They are commonly manufactured from polished 316L stainless steel with high-quality surface finishes.

TYPICAL APPLICATIONS

- Pharmaceutical manufacturing
- Biotechnology
- Food processing
- Beverage production
- Dairy processing
- Cosmetics manufacturing
- Personal care products

These industries often require housings that can be fully cleaned and sterilised without dismantling the filtration system.

HYGIENIC DESIGN FEATURES

- Electropolished or polished internal surfaces
- Crevice-free construction
- Hygienic welds
- Minimal dead legs
- Tri-Clamp connections
- FDA-compliant seals
- Full drainability
- CIP (Clean-in-Place) compatibility
- SIP (Steam-in-Place) compatibility

These design features help minimise contamination risks while simplifying cleaning and maintenance procedures.

Design Standards

Industrial filter housings are manufactured to recognised international design standards to ensure safety, reliability and regulatory compliance. The applicable standard depends on the intended application and geographical market.

Pressure Equipment Directive (PED)

For equipment supplied within Europe, many industrial filter housings are designed and manufactured in accordance with the Pressure Equipment Directive (PED). PED establishes essential safety requirements for pressure-containing equipment and ensures products meet appropriate design, manufacturing and testing criteria.

ASME

Many high-pressure filter housings are manufactured in accordance with the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code. ASME-certified vessels are commonly specified in:

- Oil and gas
- Petrochemical
- Pharmaceutical
- Chemical processing
- Power generation

These standards provide confidence in the structural integrity of pressure vessels operating under demanding conditions.

ISO Quality Standards

Leading manufacturers operate quality management systems certified to ISO 9001, ensuring consistent manufacturing processes, traceability and product quality. Additional standards may apply depending on the application, including those related to food contact materials or pharmaceutical manufacturing.

Connection Types

Choosing the correct inlet and outlet connections ensures compatibility with existing pipework and simplifies installation. The most common connection options include:

BSP Threaded Connections

British Standard Pipe (BSP) threaded connections are widely used throughout the UK and Europe.

TYPICAL APPLICATIONS

- Water treatment
- General industrial filtration
- Utility services

ADVANTAGES

- Easy installation
- Readily available fittings
- Cost-effective

NPT Threaded Connections

National Pipe Thread (NPT) connections are commonly used in North America and international industrial installations. They provide a robust threaded seal suitable for many industrial applications.

Tri-Clamp Connections

Tri-Clamp (Tri-Clover) fittings are the preferred choice for hygienic processing industries.

APPLICATIONS

- Pharmaceutical production
- Dairy processing
- Beverage manufacturing
- Biotechnology

ADVANTAGES

- Quick assembly
- Easy cleaning
- Hygienic design
- No threaded product contact surfaces

Flanged Connections

Larger industrial housings frequently use flanged connections. Benefits include high pressure capability, secure sealing, suitability for large pipe diameters and easy maintenance. Flanged systems are widely used in water treatment plants, chemical processing facilities and large industrial filtration installations.

Housing Materials Beyond Stainless Steel

Although stainless steel is the most common choice, alternative materials may be used where specific operating conditions require them.

Carbon Steel

Suitable for:

- Industrial water
- Oils
- Cooling systems
- Utility services

Often supplied with protective internal coatings to improve corrosion resistance.

Polypropylene

Ideal for:

- Corrosive chemicals
- Acid transfer
- Laboratory systems
- Lower pressure applications

Polypropylene housings provide excellent resistance to many aggressive chemicals while offering a lightweight and economical alternative to stainless steel.

PVDF

PVDF housings are selected where exceptional chemical resistance is required. Typical applications include:

- High-purity chemicals
- Semiconductor manufacturing
- Strong acids
- Solvent processing

Although more expensive than polypropylene, PVDF provides outstanding long-term chemical resistance in demanding environments.

Industrial Applications

Industrial filter housings are used across virtually every manufacturing sector where liquids or gases require filtration. Although the filter element performs the actual separation of contaminants, the housing provides the pressure containment, sealing integrity and structural support needed for safe and reliable operation. Selecting the correct housing design helps maximise filter performance while ensuring compliance with industry regulations and process requirements.

Water Treatment

Water treatment remains one of the largest applications for industrial filter housings.

- Municipal water treatment
- Reverse osmosis pre-filtration
- Borehole water
- Process water
- Cooling water
- Boiler feedwater
- Drinking water production
- Wastewater treatment

Depending on the application, housings may contain depth filters, pleated cartridges, activated carbon cartridges or membrane filters. Multi-cartridge stainless steel housings are commonly used where high flow rates are required.

Food & Beverage Production

Food manufacturers require hygienic filtration systems that protect product quality while complying with strict food safety regulations. Filter housings are used throughout:

- Brewing
- Wine production
- Bottled water
- Soft drinks
- Dairy processing
- Edible oils
- Liquid sugar
- Syrup production

Sanitary 316L stainless steel housings with polished internal surfaces and Tri-Clamp connections are widely used throughout the industry.

Pharmaceutical Manufacturing

Pharmaceutical processes require the highest levels of cleanliness and product integrity. Filter housings are installed for:

- Purified Water (PW)
- Water for Injection (WFI)
- Buffer preparation
- Cell culture
- Bulk pharmaceutical ingredients
- Sterile filtration
- Compressed gases
- Clean steam systems

Housings are typically manufactured from electropolished 316L stainless steel and designed for Clean-in-Place (CIP) and Steam-in-Place (SIP) operation.

Chemical Processing

Chemical manufacturing often involves corrosive fluids, elevated temperatures and demanding operating conditions. Filter housings are commonly used for:

- Acids
- Alkalis
- Solvents
- Fine chemicals
- Resins
- Adhesives
- Process intermediates
- Industrial cleaning chemicals

Selecting the correct housing material and seal compatibility is essential to ensure safe operation and long service life.

Paints, Coatings and Inks

Filtration helps remove gels, pigments and solid contaminants before filling or further processing. Typical applications include:

- Decorative paints
- Industrial coatings
- Printing inks
- Resin production
- Pigment dispersion

Bag filter housings are particularly popular due to their high dirt-holding capacity and economical operation.

Electronics and Semiconductor Manufacturing

Electronics manufacturing requires exceptionally clean process fluids. Even microscopic contamination can damage semiconductor wafers or precision electronic components. Filter housings protect:

- Ultra-pure water systems
- Chemical delivery systems
- Etching chemicals
- Cleaning solutions

High-purity stainless steel housings with low extractable materials are commonly specified for these applications.

How to Select the Right Filter Housing

Selecting the correct filter housing involves evaluating the complete process rather than focusing solely on the filter element. The following considerations should be reviewed during system design.

1

Step 1 – Determine the Filtration Method

Identify whether the application requires:

- Cartridge filtration
- Bag filtration
- Membrane filtration
- Activated carbon filtration
- Multi-stage filtration

The housing must be compatible with the chosen filter media.

2

Step 2 – Calculate the Required Flow Rate

The housing should comfortably accommodate both normal operating flow and peak demand. Oversizing often provides several benefits:

- Lower pressure drop
- Longer filter life
- Reduced maintenance
- Greater operational flexibility

3

Step 3 – Confirm Operating Pressure

Always ensure the housing pressure rating exceeds the maximum system operating pressure with an appropriate safety margin. Consider:

- Normal operating pressure
- Pressure surges
- Pump start-up conditions
- Temperature effects

4

Step 4 – Select the Housing Material

Typical recommendations include:

- **304 Stainless Steel** — general industrial filtration, water treatment, utilities
- **316L Stainless Steel** — food production, pharmaceuticals, chemicals, hygienic processing
- **Polypropylene** — corrosive chemicals, lower pressure systems
- **PVDF** — aggressive acids, solvents, high-purity chemicals

5

Step 5 – Select the Connection Type

Consider compatibility with existing pipework. Common options include:

- BSP threaded
- NPT threaded
- Tri-Clamp
- Flanged
- ANSI flange
- DIN flange

6

Step 6 – Consider Maintenance Requirements

When selecting a housing, maintenance access is often overlooked. Features that simplify servicing include:

- Swing-bolt closures
- Quick-release clamps
- Lifting davits
- Vent valves
- Drain valves
- Easy cartridge location

These features reduce maintenance time and improve operator safety.

Maintenance and Inspection

Routine inspection and maintenance are essential for ensuring reliable filtration performance and extending equipment life. Regular maintenance should include:

- Inspecting O-rings and seals
- Checking vent and drain valves
- Cleaning internal surfaces
- Inspecting support plates
- Examining cartridge adaptors
- Verifying pressure gauges
- Checking closure mechanisms
- Inspecting for corrosion or damage

For hygienic applications, documented cleaning procedures should be followed to maintain product quality and regulatory compliance.

Common Problems and Troubleshooting

Even high-quality filter housings can experience operational issues if incorrectly installed or maintained.

Leakage Around the Lid

POSSIBLE CAUSES

- Damaged O-ring
- Incorrect seal installation
- Uneven closure tightening
- Worn gasket

Solution: Inspect and replace seals where necessary and tighten closures evenly according to the manufacturer's recommendations.

High Pressure Drop

POSSIBLE CAUSES

- Blocked filter cartridges
- Excessive flow rate
- Incorrect cartridge selection

Solution: Replace filter elements and review cartridge sizing and system flow requirements.

Internal Corrosion

POSSIBLE CAUSES

- Incorrect housing material
- Aggressive process chemicals
- Poor cleaning practices

Solution: Review chemical compatibility and consider upgrading to a more suitable housing material, such as 316L stainless steel or PVDF.

Cartridge Bypass

POSSIBLE CAUSES

- Incorrect cartridge installation
- Damaged adaptor
- Worn sealing components

Solution: Inspect cartridge seating and replace damaged components to ensure a secure seal.

Difficult Maintenance

POSSIBLE CAUSES

- Restricted access
- Heavy housing lids
- Inadequate lifting equipment

Solution: Consider housings fitted with swing-bolt closures, lifting davits or quick-opening mechanisms to improve safety and reduce servicing time.

Frequently Asked Questions

What is a filter housing?

A filter housing is a pressure vessel that holds filter cartridges or filter bags and directs liquid or gas through the filtration media to remove contaminants.

What material is best for a filter housing?

For most industrial applications, stainless steel offers the best combination of strength, corrosion resistance and durability. 316L stainless steel is generally preferred for hygienic, pharmaceutical and corrosive applications.

What is the difference between a cartridge housing and a bag housing?

Cartridge housings are designed to hold rigid filter cartridges, while bag housings use flexible filter bags supported by an internal basket. Bag housings are typically chosen for higher flow rates and greater dirt-holding capacity.

When should I choose a multi-cartridge housing?

Multi-cartridge housings are ideal where higher flow rates, longer service intervals or continuous production are required. They distribute flow across several cartridges, reducing pressure drop and extending filter life.

What pressure rating do I need?

The housing should always have a maximum allowable working pressure greater than the highest pressure expected in the system, including pressure surges.

What is a sanitary filter housing?

A sanitary filter housing is designed for hygienic applications and typically features polished 316L stainless steel construction, Tri-Clamp connections and compatibility with CIP and SIP cleaning processes.

Can filter housings be used with different cartridge types?

Many housings are designed to accept specific cartridge configurations such as DOE, 222 O-ring or 226 O-ring cartridges. Always confirm compatibility before installation.

How often should filter housings be cleaned?

The frequency depends on the application, but housings should be inspected and cleaned whenever filter elements are replaced or as part of a planned preventative maintenance programme.

Can one housing be used for multiple filtration stages?

Yes. Many systems use the same housing design with different cartridge types for pre-filtration, fine filtration and final polishing, provided the housing is compatible with the chosen filter elements.

How long do stainless steel filter housings last?

With correct material selection, proper maintenance and suitable operating conditions, a high-quality stainless steel filter housing can provide decades of reliable service.

Conclusion

Filter housings are a critical component of every industrial filtration system, providing the structural integrity, pressure containment and sealing performance required to ensure effective contaminant removal. Whether supporting a single cartridge, multiple cartridges or liquid filter bags, the correct housing selection directly influences filtration efficiency, maintenance requirements and long-term operating costs.

By considering factors such as flow rate, pressure rating, housing material, connection type and regulatory requirements, engineers can specify a filtration system that delivers reliable performance across a wide range of industrial applications.

From compact single-cartridge housings for laboratory systems to large multi-cartridge and multi-bag vessels for high-flow industrial processes, selecting the right housing helps maximise equipment protection, improve product quality and reduce total cost of ownership.

PoreFiltration offers a comprehensive range of stainless steel filter housings, sanitary vessels, cartridge housings and bag filter housings designed to meet the demands of water treatment, food and beverage production, pharmaceutical manufacturing, chemical processing and many other industrial sectors.

Cleaner Liquids. Better Performance.

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