

Filter Cartridge 5 Inch

A practical guide to filter cartridge 5 inch, covering the reader intent, the relationship to filter cartridge 5 inch, key evaluation criteria, common risks, and the information the intended project audience should confirm before taking the next step.



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Main topic: Filter Cartridges

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In industrial filtration, the selection of the correct housing and element size is critical to maintaining process efficiency and protecting downstream equipment. The filter cartridge 5 inch (approximately 127mm in length) represents a standardized compact format widely utilized in applications where space is limited, flow rates are moderate, or point-of-use filtration is required. While larger 10-inch, 20-inch, and 40-inch cartridges are common in high-volume processing, the 5-inch variant serves a vital role in pilot plants, laboratory settings, and specialized industrial machinery.

Selecting the right Filter Cartridges involves more than just matching the length. Engineers must evaluate material compatibility, structural integrity under pressure, and the specific filtration mechanics required for the medium—whether liquid or gas. For demanding environments involving high temperatures, corrosive chemicals, or high-pressure differentials, stainless steel 5-inch cartridges offer significant advantages over disposable polymer alternatives.

Understanding the Role of 5-Inch Filter Cartridges in Industrial Systems

The 5-inch filter cartridge is often the preferred choice for localized filtration within a larger system. In many industrial configurations, a primary filtration stage handles the bulk of the contaminant load, while smaller 5-inch units are placed immediately before sensitive components like spray nozzles, analytical instruments, or high-pressure pumps.

This size is also standard in "Junior" style filter housings. These housings are designed for low-hold-up volumes, which is essential when processing expensive fluids or when frequent batch changes require minimal product loss. By utilizing a filter cartridge 5 inch format, facilities can achieve high-precision filtration without the footprint or the fluid waste associated with larger vessels.

Technical Specifications and Dimensional Standards

When specifying a 5-inch cartridge, dimensional accuracy is paramount to ensure a proper seal within the housing. A bypass—where fluid flows around the filter media rather than through it—can compromise the entire process.

| Length and Diameter

While the nominal length is 5 inches, the actual physical length can vary slightly depending on the end-cap configuration. Standard outer diameters (OD) for these cartridges typically range from 2.5 inches (64mm) to 2.75 inches (70mm). In specialized high-flow or heavy-dirt-loading applications, the diameter may be increased, though the length remains constant to fit standard junior housings.

| End-Cap Configurations

The interface between the cartridge and the housing determines the sealing mechanism. Common configurations for 5-inch cartridges include:

Double Open End (DOE): Features flat gaskets on both ends. This is common in basic sediment filtration but may be prone to bypass if not seated correctly.

Code 7 (226 O-Rings/Fin): Utilizes two 226 O-rings and a locking tab system to ensure a secure, leak-proof fit, often used in critical pharmaceutical or chemical applications.

Code 3 (222 O-Rings/Flat): Features two 222 O-rings with a flat end, providing a reliable seal for liquid filtration.

Threaded Connections: In high-pressure metal filtration, 5-inch cartridges may feature NPT or BSP threaded fittings for a rigid, permanent seal.

| Material Engineering: The Case for Stainless Steel

While many 5-inch filters are available in polypropylene or pleated paper, industrial engineers often turn to stainless steel for more rigorous applications. Stainless steel Filter Cartridges provide mechanical strength and chemical resistance that synthetic fibers cannot match.

| 304 vs. 316L Stainless Steel

304 Stainless Steel: Suitable for general industrial use, offering good resistance to oxidation and many organic chemicals.

316L Stainless Steel: The "L" stands for low carbon, which improves weldability and resistance to intergranular corrosion. This material is the standard for pharmaceutical, food and beverage, and marine environments due to its superior resistance to chlorides and acids.

| Media Types

Within the 5-inch stainless steel format, the media can be constructed in several ways:

1. **Cylindrical Wire Mesh:** Provides surface filtration with a precise pore size. It is easy to clean and ideal for removing hard, non-deformable particles.
2. **Pleated Wire Mesh:** By pleating the mesh, the surface area of a 5-inch cartridge can be increased by 2 to 3 times compared to a cylindrical design. This leads to lower pressure drops and longer intervals between cleanings.
3. **Sintered Metal Fiber:** Created by compressing and bonding stainless steel fibers, this media provides depth filtration. It is excellent for removing gel-like contaminants and offers high dirt-holding capacity.
4. **Sintered Powder:** Used for extremely fine filtration, often in gas applications or steam filtration, where high structural rigidity is required.

| Performance Metrics: Flow Rate and Pressure Drop

For any engineer, the relationship between flow rate and pressure drop (ΔP) is the primary performance metric. Because a filter cartridge 5 inch has less surface area than a 10-inch or 20-inch version, the flow velocity through the media (flux) will be higher for the same total flow rate.

| Calculating Flux

Flux is defined as the flow rate per unit of filter area. If a system requires 10 gallons per minute (GPM) and uses a 5-inch cartridge, the stress on the media is significantly higher than if a 10-inch cartridge were used. If the flux is too high, it can lead to:

Premature Clogging: Particles are forced deeper into the media or compressed against the surface faster.

Contaminant Breakthrough: High pressure may force deformable particles through the pores.

Structural Failure: Excessive pressure differential can cause the cartridge core to collapse or the media to pleat-pinch.

To mitigate these risks, engineers often specify pleated stainless steel designs for 5-inch housings to maximize the available surface area, thereby reducing the flux and extending the service life of the element.

| Selection Criteria for Engineering and Procurement

When sourcing a filter cartridge 5 inch, procurement teams and engineers should collaborate to confirm the following technical parameters:

| 1. Micron Rating (Absolute vs. Nominal)

An absolute rating implies that 99.9% of particles of a specific size will be captured. A nominal rating is more of a guideline, often capturing only 60% to 90% of the specified particle size. For critical protection of downstream equipment, absolute-rated stainless steel mesh is often required.

| 2. Operating Temperature

Standard polymer cartridges often lose structural integrity above 60°C (140°F). Stainless steel cartridges can operate at temperatures exceeding 250°C (482°F), depending on the seal material (Viton, PTFE, or Silicone).

| 3. Chemical Compatibility

The fluid being filtered must be compatible with both the filter media and the hardware (end caps and core). Stainless steel is generally inert to a wide range of solvents, oils, and fuels, making it a versatile choice for chemical processing.

| 4. Viscosity of the Medium

High-viscosity fluids (like resins or heavy oils) create higher initial pressure drops. In a 5-inch format, this may require a coarser mesh or a significantly larger surface area (pleating) to maintain a functional flow rate.

| Customization and OEM Solutions

In many B2B scenarios, a standard off-the-shelf filter cartridge 5 inch may not meet the specific needs of a proprietary machine or a unique chemical process. Customization allows for the optimization of the filtration system.

| Custom End-Caps and Fittings

OEM manufacturers often require unique mounting interfaces to ensure that only authorized replacement filters are used or to fit within a proprietary housing design. Custom machining of end caps in 316L stainless steel allows for seamless integration into specialized equipment.

| Reinforced Cores

For high-pressure hydraulic applications or systems subject to frequent pressure surges, a reinforced internal core is necessary. This prevents the cartridge from collapsing under high differential pressure, a common failure point in lower-quality 5-inch filters.

| Specialized Coatings

In some instances, stainless steel filters can be passivated or coated with materials like PTFE to enhance release properties during cleaning or to provide additional resistance to specific aggressive chemicals.

| Total Cost of Ownership and Maintenance

While the initial purchase price of a stainless steel filter cartridge 5 inch is higher than that of a disposable plastic filter, the Total Cost of Ownership (TCO) is often lower in industrial environments.

| Cleanability and Reuse

Unlike disposable cartridges, stainless steel elements can be cleaned and reused. Cleaning methods include:

Backwashing: Reversing the flow of clean fluid through the filter to dislodge surface contaminants.

Ultrasonic Cleaning: Using high-frequency sound waves in a solvent bath to remove deeply embedded particles from sintered media.

Chemical Cleaning: Using acids or bases to dissolve organic or inorganic scaling.

| Waste Reduction

For facilities looking to improve their environmental footprint, switching from disposable to cleanable 5-inch cartridges significantly reduces the volume of solid waste. This is particularly important when the filtered material is hazardous, as the disposal costs for contaminated plastic filters can be substantial.

| Replacement Cycles

In a well-maintained system, a stainless steel cartridge can last for years. The primary reason for replacement is usually physical damage during handling or if the media becomes "blinded" by contaminants that cannot be removed by cleaning. Monitoring the pressure differential across the filter is the most effective way to determine when a cleaning cycle or replacement is necessary.

| Conclusion: Confirming the Right Specification

Before finalizing a purchase for a filter cartridge 5 inch, engineers and purchasing managers should verify the exact operating conditions. This includes the maximum expected pressure, the peak temperature, and the specific nature of the contaminants. For specialized industrial applications, partnering with a manufacturer that understands the nuances of metal filtration ensures that the chosen Filter Cartridges will perform reliably under pressure.

By focusing on high-quality materials like 316L stainless steel and selecting the appropriate media structure—be it pleated mesh for high flow or sintered fiber for high dirt-holding capacity—industrial operations can achieve consistent filtration results, protect expensive machinery, and optimize their long-term operational costs.