

Tubular Backwashing Filter

# AFC, AFR & F-Series

Reduce Waste,  
Improve Process  
Efficiency  
& Increase  
Product Quality



## Industry Leading Family of Solutions

Eaton offers a full line of tubular backwashing solutions to meet your specific application demands and business needs. From the high-capacity AFR-Series for high flow in a compact footprint, to our simple single tube AFC-Series

for stand-alone applications with low solids loading, there is an Eaton solution for any process. All Eaton filters are engineered for the best performance and value in every application.

## TUBULAR BACKWASHING FEATURES & BENEFITS

- Tight retentions (as low as 2 micron) with high flow rates—ideal for a wide range of process liquids and parameters
- Eliminates the need for disposable media including bags and cartridges—reduces disposal costs, materials loss, labor, and inventory
- Choice of configurations—available solutions to optimize your system for almost any filtration challenge
- Modular scalable systems—your system can grow with your application demands
- Automated clean-in-place operation—optimizes cleaning frequency and reduces labor demands
- Wide range of operating pressures—capable of reliable operation and performance up to 1,000 psi (69 bar)

## Barrier Filtration

Barrier filtration uses either stainless steel or a fabric screen, selected for its retention and flow properties. This filtration media, within the filter housing, collects debris on its surface because the liquid flows inward. Contaminants on the surface slowly form a barrier, capable of removing smaller particles.

## Backwash Cleaning

The core principle behind backwashing, when automated, is that the filters are designed to initiate a backwash sequence when the differential pressure reaches its set point. The flow of liquid is reversed, dislodging the debris that has built up on the surface of the filter media. A drain header, located at the base of the filter, provides an outlet for the debris to be purged from the system.

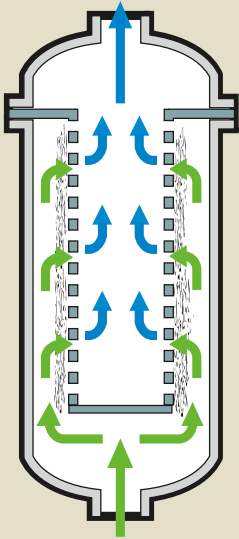


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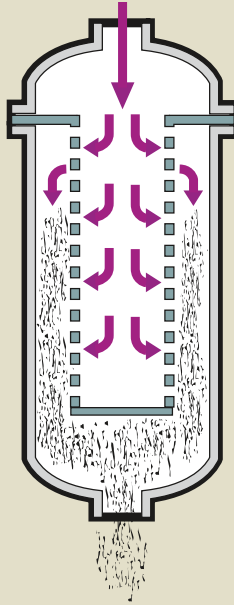
## TYPICAL APPLICATIONS

- city water lines • hot condensate • chiller water • fresh water
- whitewater / shower water • cip fluids • papermaking wet end starch • pelletizer water • single and duo tubular filters for a wide range of applications up to 1000 psi and high viscosity applications

# Tubular Backwashing Filter



Process liquid flows into the housing inlet at its base and passes across the filter media from the outside inward. Because of this flow path, contaminants collect on the outside of the filter element slowly forming a cake, removing smaller particles.



During backwash, triggered by time or pressure differential, a valve switches one station's flow from the inlet header to the drain header and the direction of the flow is reversed in the filter tube, dislodging contaminants from the media surface. The source of the cleaning fluid may be a diversion of process fluids (internal backwashing) or an external source (external backwashing).

Contaminants and the fluids used for cleaning are expelled through the drain header at the base of the unit. Once backwashing is complete, the flow is reversed again and normal filtration resumes.

## Cake formation increases filtration efficiency

Whereas the filtration media provides some of the filtration action, collected contaminants further increase efficiency. We call this phenomenon "cake formation." The collected solids, or "cake," trap additional contaminants. The key to making this principle work is timely cleaning—too soon and you lose the benefit, too late and the system flow becomes hindered.

Eaton's filtration systems come factory pre-set to backwash when the differential pressure from inlet to outlet reaches 15 psi (1 bar)—typically the optimum time to initiate backwashing, although this is adjustable.



When your application demands high-pressure operation—up to 1,000 psi (69 bar)—and scalable flexibility, the Eaton AFC-Series is optimal. Systems are available in single, duo, and multiplex configurations to meet your application and business demands.

For liquid filtering applications that require unattended operation, maximum uptime, and solids removal from 2 to 1,700 microns, the Eaton F-Series family of filter systems delivers unbeatable performance.



The revolutionary Eaton AFR-Series delivers high-flow filtration of water-like liquids at retentions as low as 2 micron—in a compact one-square-meter footprint.



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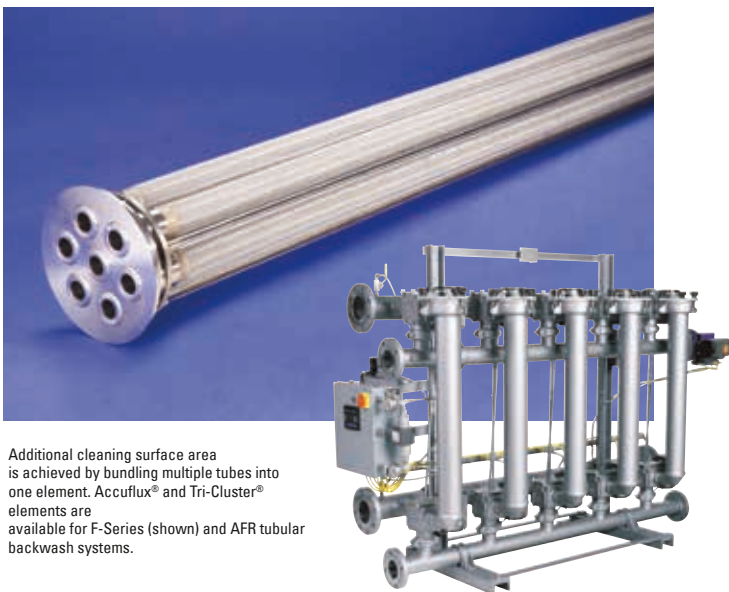
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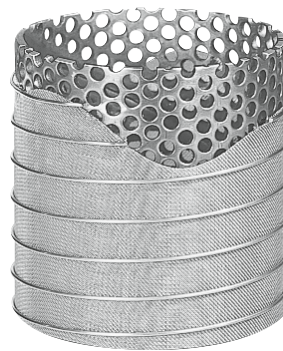
# Cleanable Media

*Matching media configuration, retention, and materials to your application is easy when selecting an Eaton tubular backwashing filtration system. Eaton offers media choices from compact configurations—that pack a large amount of surface area into a small amount of space—to simple strainer-type systems for removing larger contaminants.*



Additional cleaning surface area is achieved by bundling multiple tubes into one element. Accuflux® and Tri-Cluster® elements are available for F-Series (shown) and AFR tubular backwash systems.

## TUBULAR BACKWASHING MEDIA MATERIAL



### Wire mesh: 1,650 – 2 microns

Woven screens made of 316 stainless steel with a 316 stainless steel backing for added strength. Provide maximum open area (for high flows), excellent contaminant release properties, and a long operating life.



### Fabric: 230 – 2 microns

For the finest filtration applications, fabric media deliver reliable contaminant removal down to 1 micron. Fabric screens are supported by a 316 stainless steel backing and are chemically compatible with most process liquids.



### Slotted: 1,600 – 25 microns

Made by winding a continuous triangular-shaped wire around a series of vertical support stringers, these media require no backing. Their inherent strength makes them ideal for reliable performance with abrasive slurries or fibrous materials.



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# Tubular Backwashing Filter Media

Media	Particle Retention			Type						Percentage of Open Area	
	Mesh	Inches	Micron	Single	Tri-Cluster	Five-Cluster	Seven-Cluster	Accuflux 7	Accuflux 15		
WIRE MESH	10	0.065	1650	x	x	x				56%	
	20	0.035	890	x	x	x				46%	
	30	0.023	585	x	x	x	x		x	41%	
	40	0.015	380	x	x	x	x		x	36%	
	60	0.009	230	x	x	x	x		x	27%	
	80	0.007	180	x	x	x	x			32%	
	100	0.0055	140	x	x	x	x		x	30%	
	150	0.0046	115	x	x	x	x			37%	
	200	0.0033	84	x	x	x				33%	
	250	0.0024	60	x	x	x		x	x	36%	
	400	0.0018	45	x	x	x		x	x	36%	
	700	0.0012	30	x	x	x		x	x	25%	
	-	-	20						x	x	-
	-	-	10						x	x	-
-	-	5						x	x	-	
-	-	2						x	x	-	
SLOTTED WEDGE WIRE	10	0.063	1600	x	x	x				50%	
	15	0.045	1140	x	x	x				43%	
	20	0.035	890	x	x	x				36%	
	30	0.024	610	x	x	x	x	x		30%	
	40	0.015	380	x	x	x	x	x		20%	
	60	0.009	230	x	x	x	x	x		18%	
	80	0.007	180	x	x	x				15%	
	100	0.006	150	x	x	x	x	x		13%	
	120	0.005	125	x	x	x				11%	
	150	0.004	100	x	x	x				9%	
	200	0.003	75	x	x	x				7%	
	325	0.002	50	x	x	x				5%	
	-	0.001	25	x	x	x	x	x	x	3.2%	
	FABRIC MESH	60	0.009	230	x	x	x				Percentage of open area not applicable to fabric media.
80		0.007	180	x	x	x					
100		0.0055	140	x	x	x					
150		0.0046	115	x	x	x					
250		0.0024	60	x	x	x					
500		0.0016	40	x	x						
-		-	25-30	x	x	x					
-		-	15-20	x	x	x					
-		-	5-10	x	x	x					
-	-	1-3	x	x	x						



- **ACCUFLUX®** - The most efficient way to achieve a low flux rate is to increase active filter surface area. This has been achieved with Eaton's AccuFlux media elements featuring ultra-high surface area, clustered element designs, and new-age media materials. AccuFlux elements are available in configurations with 7 or 15 individual, replaceable filter tubes
- **TRI-CLUSTER®** - Three-tube 1 1/2" diameter media for 40% greater surface area than single element designs, with an economical initial investment
- **Additional Media Options** - Select from single tube to five-cluster or seven-cluster designs to meet your specific demands. All are available in wire mesh, fabric, and slotted wedge wire designs

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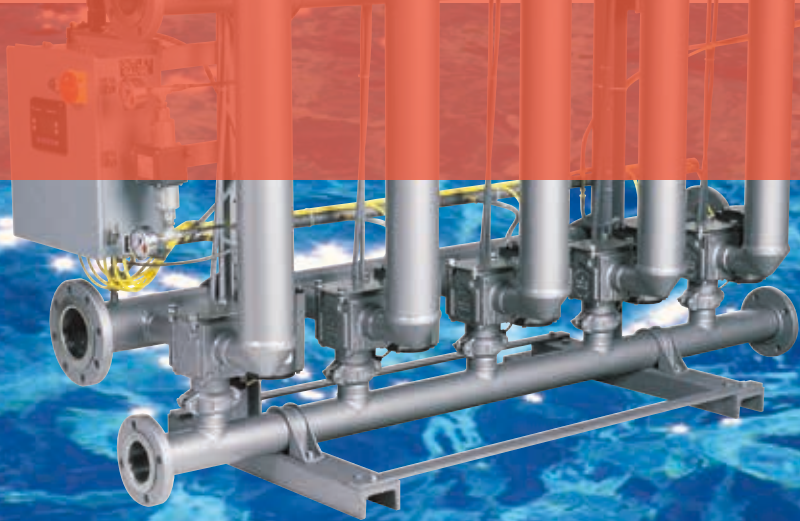
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Tubular Backwashing Filter

# Components & Options



*Eaton offers tubular backwashing systems with a full spectrum of standard and optional features. You can customize a system to precisely fit the demands of your application and process. Our experienced team can help seamlessly integrate a filtration solution into your new or existing application for optimum performance.*



### 3-way ball valves

To ensure positive sealing and maximum flow, Eaton's F-Series filters and AFC Multiplex Filters feature the industry's best 3-way ball valves. These important components—designed and manufactured exclusively for Eaton systems—were developed specifically for the demands of industrial filtration. The full-ported design reduces pressure drop and requires no additional linkages for actuation.

## TUBULAR BACKWASHING CONTROL OPTIONS



### Full-Automatic

Fully Automatic PLC control system utilizing Eaton, Allen-Bradley or Siemens controllers. Ideal for machinery OEM's, provides the most value with the latest technology and advanced feature set in an economical hardware and software package

Features include:

- HMI Interface w/ LCD display
- Ethernet communication



### Semi-Automatic

The semi-automatic design includes rotary actuators, solenoid valves, differential pressure switch, and a terminal strip for wiring to the customer's control system. The enclosure is epoxy coated carbon steel and is mounted to the filter frame. Includes mode lights and selector switch (run/stop/backwash).



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## WIDE RANGE OF AVAILABLE OPTIONS

Eaton tubular backwashing systems can be ordered with a wealth of custom options to precisely match your application and business demands. Examples include:

- ASME code vessels (F-Series housings only)
- Quick couplers on inlet and outlet of body tubes on F-Series housings for easy removal
- Back-to-back station configuration to reduce footprint (available on multiplex units with four or more stations)
- 304 stainless steel frame material
- Butterfly isolation valves on each station (AFR-Series only)
- Electropolished interiors available upon request

## System and media sealing

A filtration system that leaks or allows process fluid bypass is not effective.

Eaton sealing systems are designed to ensure that even with minimal training, your operators can easily obtain a perfect seal. We also offer a wide range of elastomer materials to meet the temperature, pressure, and chemical properties of your process stream.



## A total process perspective

When you choose Eaton as your filtration partner for a tubular backwashing system, you are choosing an expert. Not just in the science of filtration, but in how it can benefit your manufacturing process and even help you meet specific production objectives. We consider not just the filter, but how it integrates into your entire process. We can show you the impact that a change in filtration can offer your business.



## Differential pressure system for optimum cleaning timing

Automated systems are designed to initiate a backwash sequence when the differential pressure reaches its set point. A timer switch is also used as a backup.

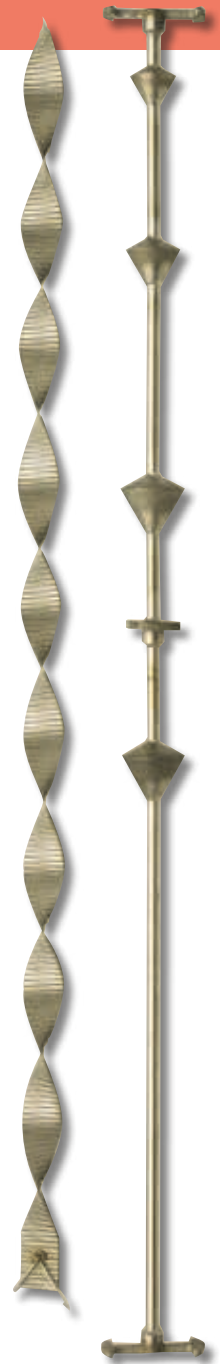


## Drain header trap for efficient backwashing

The addition of a simple, optional drain header trap prevents the drain header from drying out and helps minimize water-hammering during the cleaning cycle.

## Diffusers optimize cleaning

For challenging solids removal, Eaton offers two styles of backwash diffusers to effectively distribute backwash flow and ensure removal of all contaminants from the filtration media.



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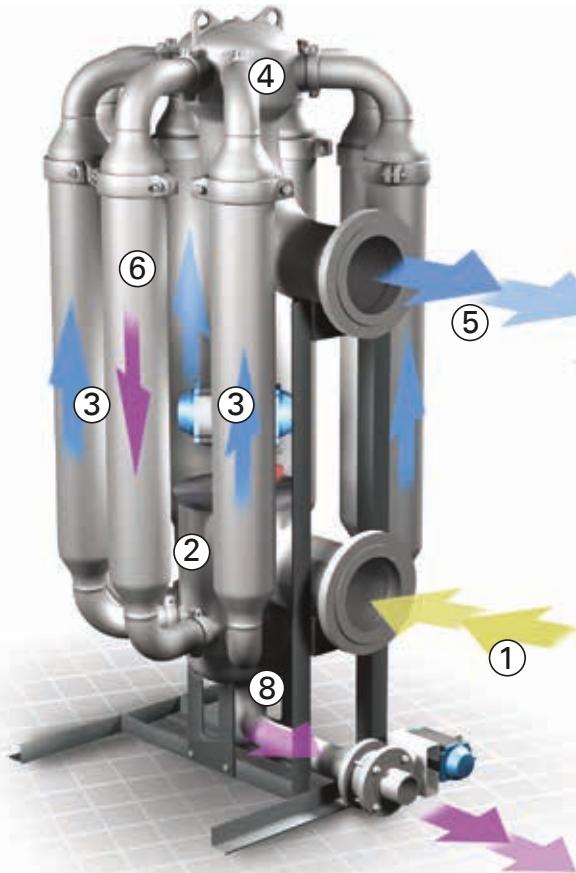
# Pressure Tactics

Tubular backwashing systems save you time and money compared with disposable media systems. The permanent media of Eaton's AFR, AFC, and F-Series systems is "cleaned-in-place" using reverse flow technology. System maintenance is significantly reduced and the cost of landfill disposal is eliminated.

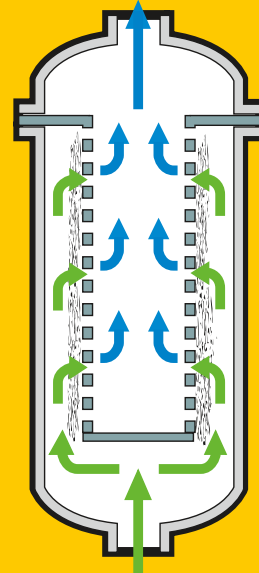
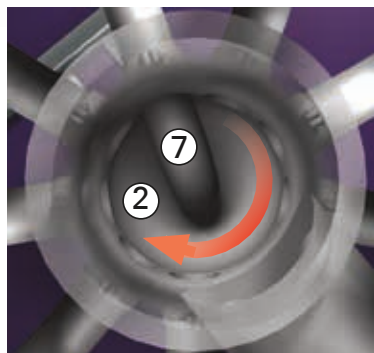
### How the AFR-Series Works

The simple, space-saving design of the AFR-Series – with only a single moving part – is ideal for the most demanding applications. The unit features a circular configuration of up to 8 tubes surrounding a central cleaning valve. During the filtration phase, filtrate travels from the inlet (1) to the diverter chamber (2) and up into the filter tubes (3). Cleaned liquids flow to the upper chamber (4) and out the large outlet near the top of the unit (5).

All tubes can be in filtration mode or the diverter mechanism can be rotated so that each individual tube (6) can be backwashed while the others remain in filtration mode.

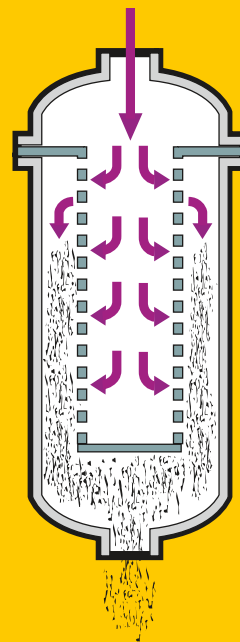


During backwash, a diverter (7) inside the cleaning valve rotates to the tube to be cleaned. This closes the tube to the incoming process liquid and opens it to the atmosphere via the drain line (8). The result causes outlet process liquid to flow in reverse through the element, cleaning it of contaminants and expelling them through the drain (8).



### Filtration Cycle

Contaminated material flows up the outside of the filter tubes, through the filter media, and the cleaned fluid is expelled to the top from inside the tube. Debris collects on the outside surface of the screen forming a cake, which facilitates efficient filtration.



### Backwashing Cycle

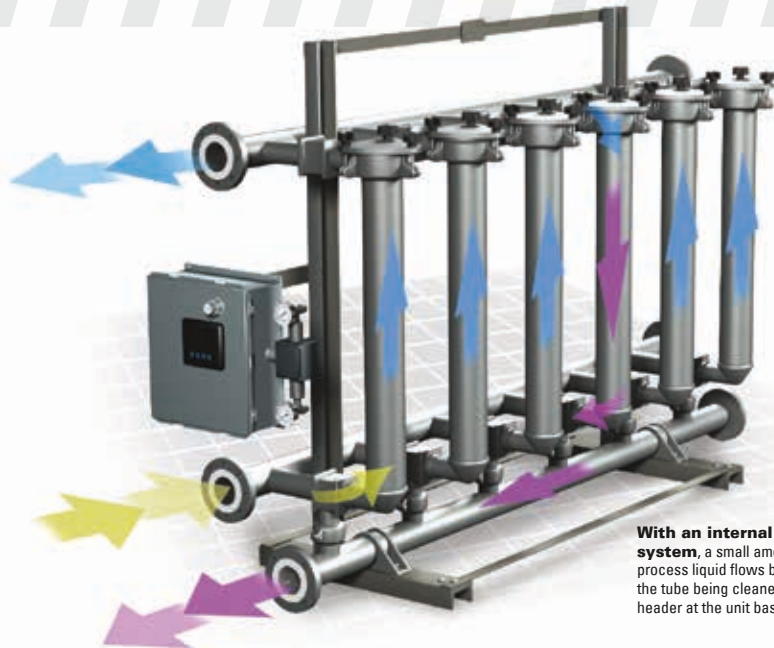
During backwash, triggered by time or pressure differential, the direction of the flow is reversed in the filter tube causing contaminants on the media surface to become dislodged and allowing them to be purged downward and out the drain valve.



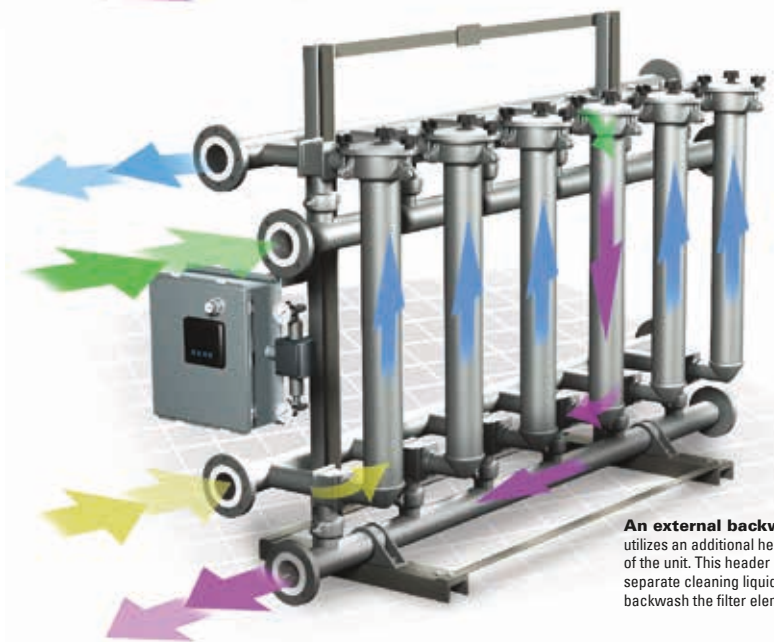
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# TECHNICAL INFORMATION

## Tubular Backwashing Systems



**With an internal backwashing system,** a small amount of clean process liquid flows backward through the tube being cleaned and out the drain header at the unit base.



**An external backwashing system** utilizes an additional header at the top of the unit. This header introduces a separate cleaning liquid (typically water) to backwash the filter element to the drain.

### F-Series and AFC-Series

Eaton's F-Series and AFC-Series are designed for the best possible performance. During backwash, a single tube is taken off-line from the process flow via a three-way valve. Once an element is clean, it is returned to service and the next element may be cleaned. The remaining elements in the filter remain operational throughout this cycle. F-Series and AFC-Series multiplex units consist of 2-24 individual tubes valved in parallel to common inlet, outlet, and drain headers. AFC-Series units are also available in economical single and duo tube configurations, which must be removed from service for manual cleaning.

### Internal and external backwashing configurations

Eaton's F-Series and AFC-Series tubular multiplex systems are available in both internal and external backwashing configurations. Internal backwashing systems are designed for processes with system pressure greater than or equal to 45 psi (3.1 bar) and low viscosity process liquids. External backwashing systems are designed for applications with high-value process liquids and/or processes with low operating pressures.

### System control

Designed to monitor and operate the backwash cleaning system, Eaton automatic control systems are simple to operate, reliable, and easily maintained. They are set to clean on differential pressure with a timed backup. The design allows field adjustments to suit the demands of the service conditions, ensuring effective cleaning with a minimum use of backwash fluid. Systems are available in automatic intermittent or continuous backwashing modes.



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