DuoFLO™ Filter Systems

CUNO

Filter Cartridge Benefits...
...Filter Bag Economy

DuoFLO Filter Elements fit most standard bag filter housings

DuoFLO Filter System includes housing for new installations

- Fits standard bag filter housings
- Provides up to 4 times or more life than conventional bag filters
- Eliminates filter media rupture, contaminant by-pass and unloading
- Simplifies filter installation, removal, and disposal
- Reduces hold-up volume by up to 67% or more

CUNO DuoFLO™ Filter Element

The patented CUNO DuoFLO™ filter system* is an advanced alternative to standard bag filters. Developed using CUNO's extensive depth filtration experience, the DuoFLO filter media, featuring a true graded-porosity structure, is now available to users of standard bag type filters and housings. This feature, combined with a 62 % increase in filter surface area, ensures that DuoFLO filters provide:

- up to 4 times or more the service life of conventional felt filter bags
- superior contaminant removal efficiency
- enhanced flow per filter element
- reduced total filtration costs by minimizing production downtime, disposal and labor costs.

The DuoFLO design incorporates an innovative new geometry of both filter element and restrainer basket which provides 100% 3 dimensional support of the DuoFLO media. This eliminates the potential for filter element rupture and the resulting gross contamination of the downstream effluent with previously removed particles. In addition, the unique design of the DuoFLO element reduces filter element hold-up fluid volume by 67% compared to conventional bags, minimizing worker exposure to process fluids.

CUNO utilizes state-of-the-art technology to produce the DuoFLO filter element such that both performance and filtrate quality are optimized and customer satisfaction is ensured. DuoFLO filter elements are sized to replace conventional bag filters and are available in both polypropylene and polyester materials with nominal ratings from 1 to 100 micron.

Features	Benefits
■ Unique filter design combining a graded-porosity media with 62% greater filter surface area	■ Longer Service Life – up to 4 times or more that of conventional felt filter bags
	■ Reduced Filter Usage - minimizes product loss, labor, disposal costs, and operator exposure
	■ Less down time for filter change-out increases productivity
■ Hold-up volume reduced by 67% compared to conventional bag filters.	■ Reduced product loss & related disposal costs
	■ Used element retains less fluid making it lightweight for easy removal
	■ Eliminates the need for displacement balloons and associated spillage during change-out
■ 100%, downstream support of the filter element	■ Eliminates filter rupture, contaminant bypass and unloading
	■ Allows operation to higher differential pressures before filter change-out
■ Superior flow characteristics	■ Maximizes utilization of filter surface area and maintains low operating pressure drop
	■ Reduces flow per unit area for improved effluent quality

The DuoFLO filter will easily retrofit most existing bag filter housings. To take advantage of the DuoFLO system in applications where bag filter housings are currently in use, simply remove the existing bag support basket, replace it with a DuoFLO support basket, and insert the DuoFLO filter. For new installations, CUNO offers a full line of DuoFLO filter housings. (See page 5.)

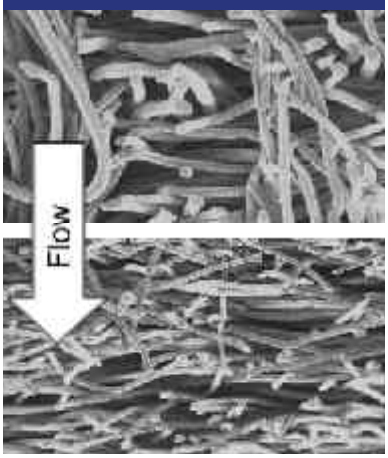
* US Patent Numbers 6,030,531 and 6,238,560, other US and foreign patents pending

DuoFLO™ Elements Provides Superior Service Life

Greater Contaminant Holding Capacity

DuoFLO filter elements are offered in a graded-porosity filter media where two media layers of different porosities are combined. The result is superior contaminant holding capacity. The added capacity is achieved by removing the larger contaminants in the first layer and the finer contaminants in the tighter, down-stream layer (Figure 1). The config-urations of each nominally rated filter media have been optimized to achieve the longest service life. In addition, media migration is eliminated by thermally bonding the exterior surface of the downstream media layer.

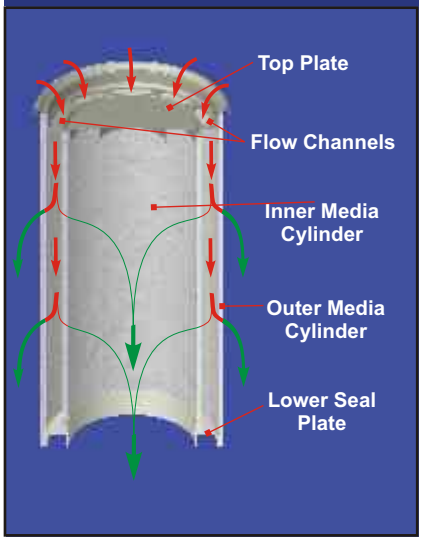
Figure 1. - DuoFLO Graded Porosity Media



Greater Media Surface Area

The DuoFLO filter design provides an increase in filter surface area of 62% when compared to commonly used #1 and #2 bag filters (Figure 2). The DuoFLO element is comprised of two cylinders bonded to a top plate and a lower seal plate. The fluid enters the top of the filter through flow channels located in the DuoFLO filter top plate. The fluid flows between the inner and outer media cylinders, and then passes through the media and support basket into the clean chamber of the filter housing. This unique design provides 62% more surface area to yield a significant increase in filter service life. Figure 2 illustrates the DuoFLO surface area geometry and its unique flow path.

Figure 2. - Unique DuoFLO Flow Path



Lower Pressure Drop and Improved Retention Efficiency

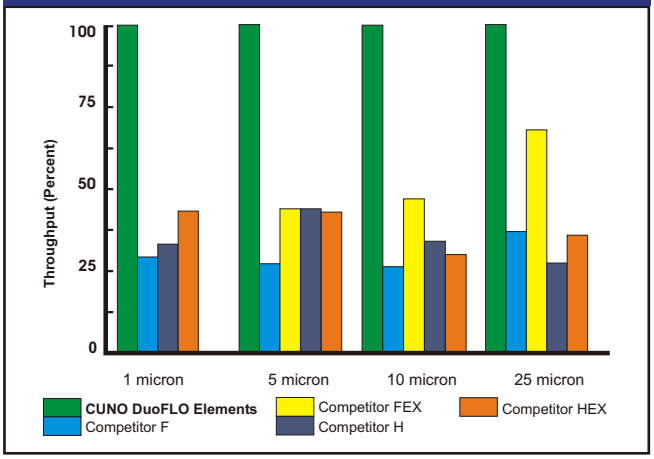
The increase in filter surface area reduces the flux (flow rate per unit area) thus lowering the initial pressure drop through the filter. This provides two key advantages.

- Lower initial pressure drop increases the time before the recommended change-out pressure is reached providing longer on line service.
- Lower flux improves the retention efficiency of the element

Superior Filter Service Life

Extensive testing has demonstrated that DuoFLO, when tested against equivalently rated felt bag filters, provides up to 4 times the throughput while maintaining superior efficiency. Filter life is inversely proportional to flux (flow per unit area of media) and reducing the flux by 50 % can achieve up to a three-fold increase in filter life. The life of the filters compared in Graph 1 were measured to the same terminal differential pressure and demonstrates the superior life of DuoFLO filters.

Graph 1. - Service Life Comparison for Polypropylene Media



DuoFLO™ Filter Elements

Simple Filter Removal - Simply insert the CUNO removal tool into the top plate and lift the filter from the housing.

Reduced Hold-Up Volume - A 67% reduction in hold-up volume significantly decreases lost product and disposal costs.

Size	Hold-Up Volume	(gallons)
#2	DuoFLO	1.4
#2	Standard bag	4.3

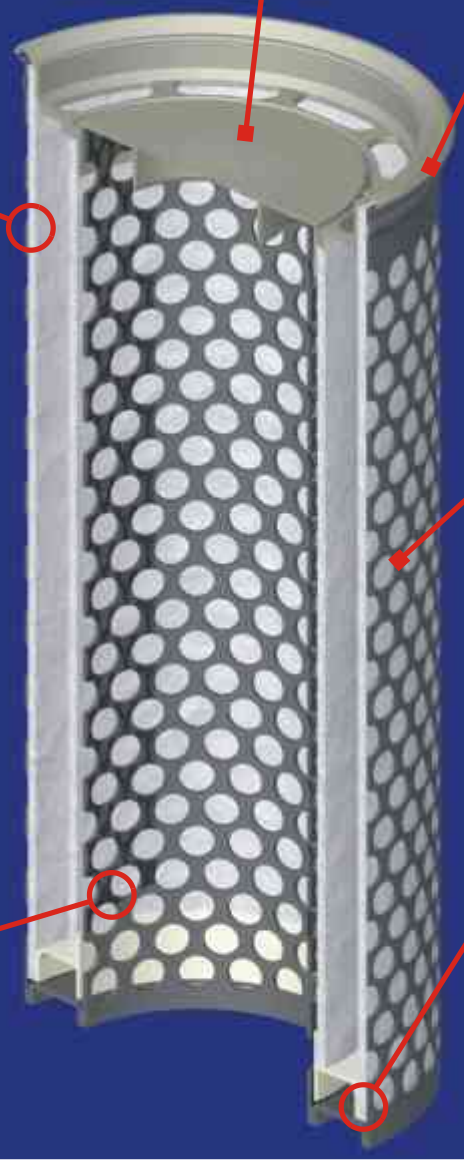
Easy Filter Installation - The DuoFLO filter element is a rigid cylinder that easily slides into the support basket.

Graded Porosity Media - DuoFLO media consists of 2 layers. The first layer or upstream zone is "open" to remove the larger contaminant while the downstream zone is "tighter" to remove the smaller contaminant. This design provides greater contaminant holding capacity and longer life than conventional single layer media.

Increased Surface Area - The unique design provides 62% more area than typical bag filters for longer life and fewer filter change-outs.

Size	Filter Area	(ft^2)
#2	DuoFLO	6.7
#2	Standard Bags	4.1

Singed Media Surface - Many filter bags release fibers that end up in the filtered product. The DuoFLO filter media is thermally treated to eliminate loose fibers.



Superior Sealing Collar - Constructed from molded polypropylene or polyester with an advanced sealing lip that provides a dynamic spring-like seal, the DuoFLO design eliminates contaminant bypass.

Support Basket - Full Support of the filter element ensures filter integrity even under the most demanding conditions by eliminating the potential for media stretching which can open the pore structure and allow larger particles to pass.

Thermal Side Seam - Using advanced thermal sealing processes, the DuoFLO seam eliminates the problem of contaminants passing through large needle holes.

Integral Media to Plate Seal - an integral seal between the plastic components and the filter media is ensured by using state-of-the-art ultrasonic welding techniques.

The unique DuoFLO element design - 62% greater area and a unique graded-porosity media structure - provides a service life advantage of up to 4 times greater than conventional filter bags. The other features (sealing collar, media treatment, thermal seaming, ultrasonic bonding of plastic parts to media) ensure that the DuoFLO filter is unsurpassed in quality and performance.

DuoFLO™ Filter Specifications and Operating Parameters

Materials of Construction

Each grade of DuoFLO filter is manufactured from high performance fibers that were selected based on extensive media performance testing. No adhesives, binders, or silicone are used in the manufacturing process. The DuoFLO filter element is available in all-polypropylene, all-polyester, or polyester media with polypropylene lower seal and top plate construction.

Filter Element Size and Ratings Available

DuoFLO elements are available in sizes and ratings to replace standard #1 and #2 filter bags as follows:

DuoFLO Filter Element Specifications

Dimension	DuoFLO Elements	
	#1 Size	#2 Size
Nominal Removal Ratings (microns)	1, 5, 10, 25, 50, and 100	
Filter Diameter (inches/cm)	7 / 17.8	
Filter Length (inches/cm)	14.3 / 36.3	28.6 / 72.6
Media Area (ft^2 / m^2)	3.4 / 0.32	6.7 / 0.62
Hold Up Volume per Filter (Gallons / Liters)	0.7 / 2.6	1.4 / 5.3

Flow Characteristics and Sizing Options

Flow vs. differential pressure for a DuoFLO #2 size element and support basket* in water is depicted in Graph 2. A typical filter system is often sized for an initial differential pressure of 0.5 to 1 psi (0.04 to 0.07 bar). A lower flow rate per element typically extends the life of the filter system.

Operating Parameters by Material and Size

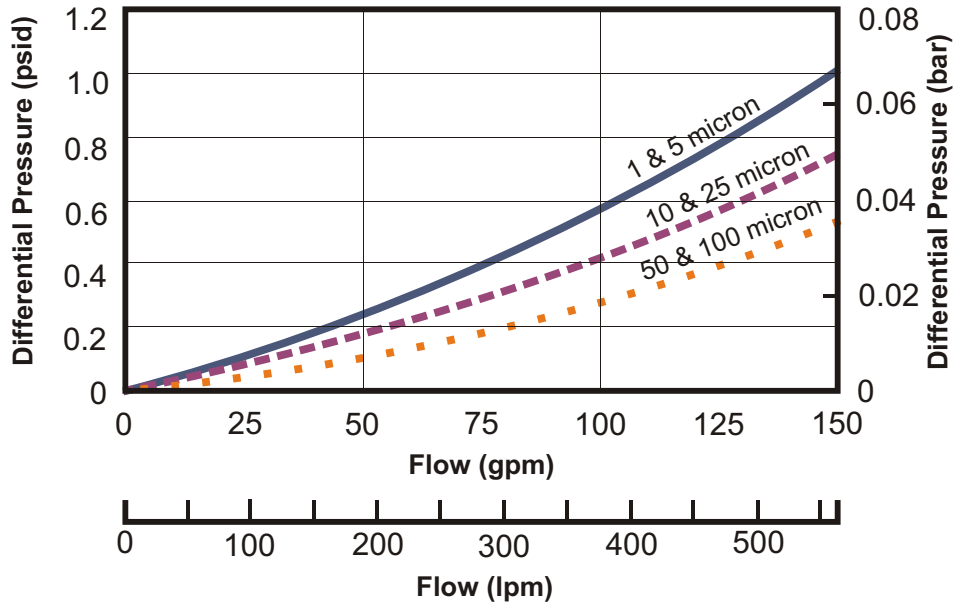
Operating conditions	DuoFLO Polypropylene		DuoFLO Polyester	
	#1 Size	#2 Size	#1 Size	#2 Size
Maximum Operating Temperature (°F / °C)	180 / 82		300 / 149	
Maximum Recommended Flow Rate (gpm / lpm)	75 / 284	150 / 568	75 / 284	150 / 568
Maximum Forward Differential Pressure	35 psid @ 68°F (2.4 bar @ 20°C)			
Recommended Change-out Differential Pressure	20 psid (1.4 bar)			
Regulatory Status (Polypropylene elements only)				
CFR Compliant	All component materials of the **DuoFLO all-polypropylene element** are listed for food contact per 21 CFR 177.1520.			

Chemical Compatibility Table

Chemical	DuoFLO Material	
	Polypropylene	Polyester
Biological Agents	Excellent	Excellent
Mineral Acids	Excellent	Good
Organic Acids	Excellent	Excellent
Alkalies	Excellent	Poor
Oxidizing Agents	Fair	Fair
Organic Solvents	Fair	Good

The thermal and chemical resistance data presented in this brochure is for guidance only. Factors such as duration, degree of concentration of a substance in a fluid and temperature should also be considered. Thermal and chemical resistance should also be considered when choosing all materials exposed to fluids.

Graph 2. - DuoFLO Water Flow Data*



*#2 Size Element and Support Basket Pressure Drop Only, housing pressure losses are not included.

DuoFLO™ ASME Code Filter Housings

CUNO DuoFLO filter housings are designed and manufactured to economically meet demanding applications. The housings are available for #1 and #2 size DuoFLO filters and are constructed from 304 or 316L stainless steel. DuoFLO housings are designed, fabricated, and "U" stamped in accordance with ASME Section VIII, Division 1 for 150 psi @ 300°F*. A variety of inlet/outlet connection styles are available (see specification table below).

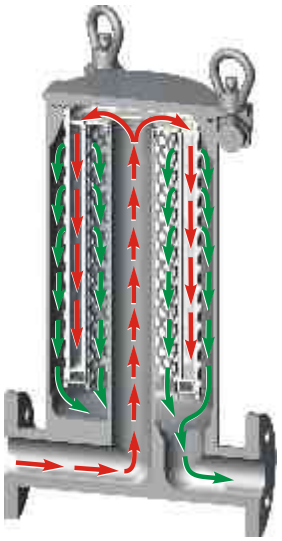
The DuoFLO filter housing allows the user to realize all of the benefits of the DuoFLO filter element. Three-point dynamic sealing of the element eliminates bypass of unfiltered fluid into the effluent stream. Since the DuoFLO filter element has more surface area and better flow characteristics, larger housings can be eliminated in favor of the smaller DuoFLO housing - reducing upfront capital expenditures and installation costs.

DuoFLO Housings - easy and cost effective to install.

The true "in-line" configuration of the inlet and outlet connections allow for installation without the additional piping and elbows required by conventional filter bag housings. This provides simple installation with most existing piping schemes. The optional adjustable legs, which allow the housing to be raised or lowered to the desired piping elevations, combined with the in-line inlet/outlet configuration, make designing new installations using DuoFLO housings easier and cost effective.

The unique flow configuration of the DuoFLO housing eliminates the "dirty chamber" that is common in bag filter housings, thus eliminating the potential for cross contamination of dirty fluid into the clean effluent during filter element change-out. DuoFLO housings incorporate an environmentally friendly design that results in reduced worker exposure by allowing removal of the used DuoFLO filter element without the spillage of, or contact by the operator with, the process fluid.

Design Feature	Benefit
■ 3 Point dynamic filter element seal	■ Ensures no bypass of unfiltered fluid into the effluent stream.
■ No dirty fluid chamber	■ Eliminates unfiltered fluid from contaminating the clean effluent side of the housing during filter change-out ■ Reduces operator contact with the fluid
■ Inline piping configuration with flanged or threaded connections	■ Significantly reduces installation time and costs ■ Ease of piping for series or parallel installation
■ Excellent flow characteristics	■ Reduces capital investment since fewer filter elements are required for a given flow rate



DuoFLO Filter Housing Specification

Size	Material	Connection Size/Type	Maximum Flow (gpm / lpm)	Maximum Pressure & Temperature	Housing Weight	Basket Weight	Leg Weight
#1	304 or 316L S.S.	2" ANSI or DIN Flange 2" NPT or 2" BSPTr	75 / 284	150 PSI @300°F * (10.4 bar @ 149°C)	80 lb/ 36.3 kg	8 lb/ 3.6 kg	4 lb/ 1.8 kg
#2			150 / 568		100 lb/ 45.4 kg	12 lb/ 5.4 kg	

* Dependent upon the material of the gasket installed.

DuoFLO™ Filter Housings

Minimized Dirty Fluid Chamber - the DuoFLO filter element extends to the top of the housing cover to significantly reduce the dirty fluid volume compared to conventional bag filter systems

3 Eye Nuts - eliminate the need for special tools and allows for quick and easy filter element installation and removal

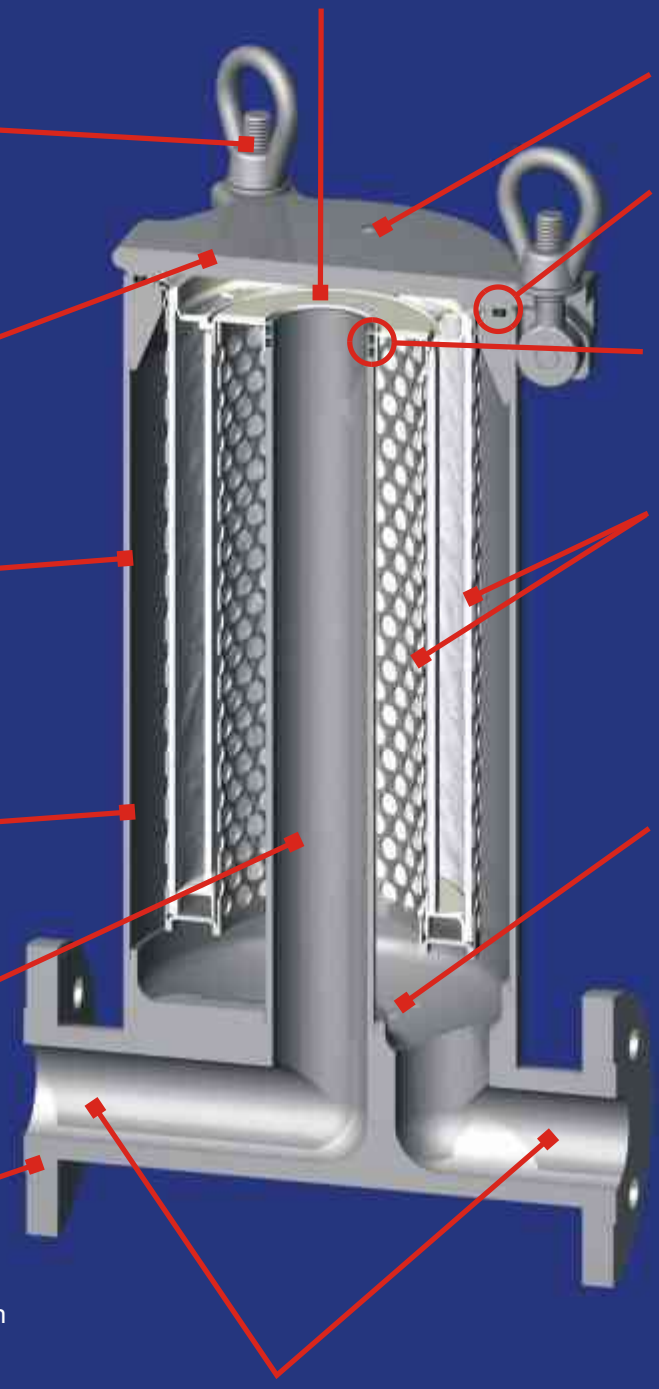
Light weight cover - remains attached to the housing and pivots open to allow easy access for filter change-out. Can be rotated for ideal pivot orientation.

304 or 316L Construction - provides compatibility with a wide range of fluids. Shot blast exterior finish improves appearance and allows for easy cleaning

ASME Code - meets local and state design requirements for pressure vessels

Inlet Stand Pipe - directs fluid to the top of the filter housing and inlet channels of the DuoFLO filter element

Available Connections - include 2" ANSI flange (shown), 2" NPT, 2" DIN flange, or 2" BSPTr to satisfy most common piping requirements



¼" NPT Connection- for easy vent valve or pressure gauge installation

O-Ring Housing Seal - to provide a positive seal between the housing and the cover when the system is in use

Double O-Ring Element Seal - Seals the DuoFLO filter element to the top of the stand pipe (inlet) ensuring no by-pass

Support Basket - Full Support of the filter element ensures filter integrity even under the most demanding conditions. Eliminates media stretching which can open the media pores and allow larger particles to pass.

Dished Bottom - drains the clean liquid to the housing outlet for better product recovery and cleaner system operation

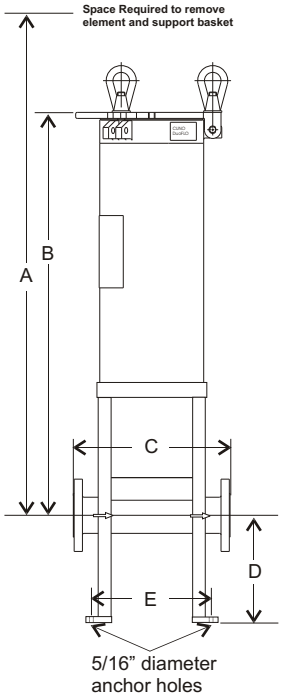
Optional Legs (shown below) - Adjustable legs can accommodate an inlet/outlet centerline height adjustment of up to 11 inches

In-line Bottom Inlet & Outlet - provides easy and cost effective installation by reducing the complexity of the piping scheme. Both the inlet and outlet piping have ½" NPT connections for drains, sample ports, or pressure gauge installation.

DuoFLO™ Filter Housing Dimensions and Piping

DuoFLO Housing Dimensions

DuoFLO System Housing							
Filter Size	Dimensions (Inches/cm)						
	A	B	C		D		E
			Flange	Thread	Max.	Min.	Bolt Circle
#1	35/89	20/51	13/33.2	11 ½/29.2	15/38.1	4/10.2	10 ½ / 26.7
#2	63/160	34/87					



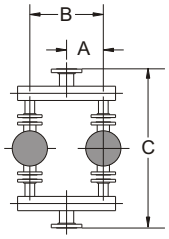
DuoFLO Filter Piping Systems

The inline bottom inlet and outlet connections offer tremendous flexibility in manifolding the housings for series or parallel filtration. This concept allows for enhanced adaptability in achieving both short and long term flow and process requirements. The diagrams below present several options to consider when planning a DuoFLO installation. Each hardware kit includes two 316L stainless steel piping manifolds, required gaskets (EPDM standard), bolts, washers and nuts. Valves and other gasket materials are optional.

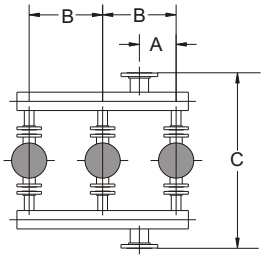
DuoFLO Filter Piping Systems

DuoFLO Filter Housings

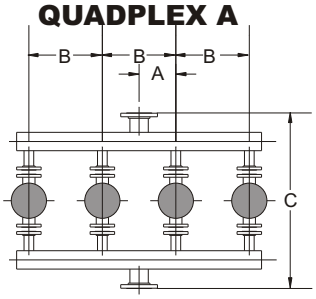
DUPLEX A



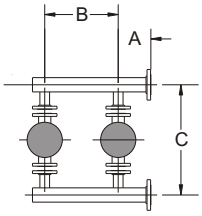
TRIPLEX A



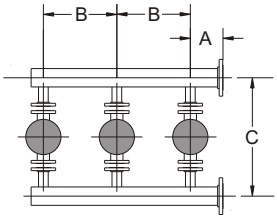
QUADPLEX A



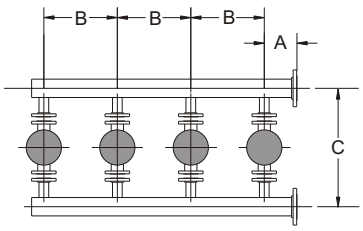
DUPLEX B



TRIPLEX B



QUADPLEX B



DuoFLO Filter Piping Housing Dimensions (inches)												
	Duplex				Triplex				Quadplex			
	A	B	C (with valve)	C (no valve)	A	B	C (with valve)	C (no valve)	A	B	C (with valve)	C (no valve)
Scheme A	9	18	41	37	9	18	45	41	9	18	45	41
Scheme B	8	18	29	25	8	18	31	27	8	18	31	27

DuoFLO™ Filter Applications

Coatings	Electrodeposition	Automotive Paint
	Trade Paint	Architectural Paint
	Can Coatings	Printing Ink
	Dispersions	Resins
	Paper Coatings	Coil Coatings
	Adhesives	
Industrial	Parts Washing	Waste Water
	Pulp & Paper	Hydraulic Fluids
	Cooling Water	Lubricants
	Ground Water	Machine Tool Coolants
	Lens Fining Water	Transformer Oil
Chemical	Acids	Alkalines
	Chemicals	Esters
	Process Water	Silicones
	Alcohols	Aerosol Products
	Glycols	Mineral Oil
	Fuels	Waxes
	Catalyst Recovery	Solvents
	Resins	
Petrochemicals	Fuel Additives	Enhanced Oil Recovery
	Glycols	Amines
	Lube Oils	Fuels
	Distillation	Injection Fluids
Food & Beverage	Vegetable Oil	Honey
	Syrups	High Fructose Corn Syrup
	Edible Oils	Vinegar
	Soft Drinks	Liquid Sugar
	Wine	Bottled Water
	Spirits	Gelatin
	Fruit Juice	Ready to Drink Tea
	Beer	Sports Drinks
Pharmaceutical	Catalyst Recovery	Active Pharmaceutical Ingredients
	Vitamin Extracts	Carbon Removal
	Bulk Pharmaceutical Chemicals	Water Systems
	OTC Solutions	Opthalmics
	Solvents	Lotions
Electronics	Etching Baths	Photochemicals
	Process Water / RO Prefiltration	Solvents
	CD's / DVD's	Printed Circuit Manufacturing
Water Treatment	Cooling Water	Ground Water
	Process Water	Waste Water
	Well Water	RO Prefiltration

DuoFLO™ Filter Support Basket

CUNO offers a complete line of DuoFLO 316 stainless steel support baskets for use in existing bag filter housings or in the DuoFLO filter housing. The DuoFLO element requires a unique basket for proper element support. Adequate support of the filter element is critical to maintaining media integrity. The DuoFLO filter basket has two concentric stainless steel cylinders to support both the inner and outer filter element sleeves providing consistent effluent quality. DuoFLO baskets include the optimum combination of strength and open area to provide:

- proper media support,
- excellent flow
- minimal pressure drop

The DuoFLO filter support basket ordering guide (below) references the competitive filter bag housing manufacturer and model and the correct DuoFLO support basket needed to upgrade to the DuoFLO filter element.

DuoFLO Filter Support Basket Ordering Guide

Existing Bag Filter Housing			Filter Size	Adapter Part Number	Gaskets Required		CUNO Basket Part Number
MFG	Model Number	Description			Basket	Adapter	
FSI	FSP - 40	1 around, side entry	#1	Not Required	No	NA	60331-32*
FSI	FSP - 85 & up	1 to 24 around, side entry	#2	Not Required	No	NA	60331-31*
Filtration Systems	112	1 around over the top	#1	60343-31	No	NA	60331-32
Filtration Systems	122	1 around over the top	#2	60343-31	No	NA	60331-31
Hayward	TBF 0101	1 around	#1	Not Required	No	NA	60331-32
Hayward	TBF 0102	1 around	#2	Not Required	No	NA	60331-31
Hayward	MBF	3 to 24 around, bottom entry	#2	Not Required	No	NA	60331-31
Hayward	SEMB	3 to 24 around, side entry	#2	Not Required	No	NA	60331-31
Parker	SB1 or 4	1 or 4 around, side entry	#1	60340-31**	No	Yes	60331-32
Parker	SB1 or 4	1 or 4 around, side entry	#2	60340-31**	No	Yes	60331-31
GAF/AFFCO	RB(1,2 or 4)_ _	1 to 4 around, over the top	#1	60339-31**	No	Yes	60331-32
GAF/AFFCO	RB(1,2 or 4)_ _L	1 to 4 around, over the top	#2	60339-31**	No	Yes	60331-31
GAF/AFFCO	RB1_ _ SE	1 around, side entry	#1	Not Required	Yes***	NA	60331-34
GAF/AFFCO	RB1_ _ L-SE	1 around, side entry	#2	Not Required	Yes***	NA	60331-33
GAF/AFFCO	RB(2 to 12)C2L	2 to 12 around, bottom	#2	Not Required	Yes***	NA	60331-33
Rosedale	8 - 15	1 around, side entry	#1	Not Required	No	NA	60331-36
Rosedale	D8 - 15	Duplex, side entry	#1	Not Required	No	NA	60331-36
Rosedale	8 - 30	1 around, side entry	#2	Not Required	No	NA	60331-35
Rosedale	D8 - 30	Duplex, side entry	#2	Not Required	No	NA	60331-35
Rosedale	16 - 48	2 to 23 around, bottom	#2	Not Required	No	NA	60331-37

*** Seal ring removal & FSI installation Tool 74132-31**

**** Adapter Part Number (includes gasket)**

Gasket	GAF/AFFCO	Parker
Nitrile	60339-31GA	60340-31GA
EPR	60339-31GB	60340-31GB
Viton	60339-31GC	60340-31GC
TEV	60339-31GD	60340-31GD

*****Basket Gasket Part Number:**

Gasket	Part Number
Nitrile	60334-36442
EPR	60334-37442
Viton	60334-38442
TEV	60334-39442

DuoFLO™ Filter Element Ordering Guide

Filter Designation	Nominal Removal Rating (Microns)	Material (Media/Plastic Components)	Element Length (inches)	Connection Style
DFG - DuoFLO Graded-Porosity	**001** - 1µm **005** - 5µm **010** - 10µm **025** - 25µm **050** - 50µm **100** - 100µm	**PP** - Polypro/Polypro **EE** - Polyester/Polyester **EP** - Polyester/Polypro	**1** - 14.3 nominal **2** - 28.6 nominal	**C** - Open (DuoFLO Housings **R** - Closed (Standard Bag Housings)

DuoFLO Filter Housing Ordering Guide

Number Around	DuoFLO	Size	Housing Material	Connection Type	Support Legs	Gasket Material
1 = 1 Around	**DF**	**1** = #1 Size **2** = # 2 Size	**B** = 304 SS **C** = 316L SS	**1** = 2" ANSI Flange **2** = 2" NPT **3** = 2" DIN Flange **4** = 2" BSPTr	**L** = Legs **N** = No legs	**GA** = Nitrile* **GB** = EPR **GC** = Viton

* Limits housing operating temperature to 250°F (121°C)

DuoFLO™ Filter Piping System Ordering Guide

Description (refer to page 7)	Part Number	
	With Valves	Without Valves
Duplex A	98847-07	98847-01
Duplex B	98847-08	98847-02
Triplex A	98847-09	98847-03
Triplex B	98847-10	98847-04
Quadplex A	98847-11	98847-05
Quadplex B	98847-12	98847-06

Other DuoFLO™ Filter Options or Tools

Housing Legs (when ordered separately) 98848-01

DuoFLO Element Installation Tool 60300-31

DuoFLO Element Removal Tool 74132-31

Filter Cartridge Benefits... Filter Bag Economy

Filter Cartridge Benefit	DuoFLO™ Element	Standard Bag Filter
High Dirt Holding Capacity	☑ Yes	No
Rigid construction provided by the media or additional support components (i.e. cage and core)	☑ Yes	No
Installation/Removal convenience – ease of use	☑ Yes	No
Predictable retention even under elevated differential pressure	☑ Yes	No
Reduced hold-up volume	☑ Yes	No

WARRANTY

Seller warrants its equipment against defects in workmanship and material for a period of 12 months from date of shipment from the factory under normal use and service and otherwise when such equipment is used in accordance with instructions furnished by Seller and for purposes disclosed in writing at the time of purchase, if any. Any unauthorized alteration or modification of the equipment by Buyer will void this warranty. Seller's liability under this warranty shall be limited to the replacement or repair, F.O.B. point of manufacture, of any defective equipment or part which, having been returned to the factory, transportation charges prepaid, has been inspected and determined by the Seller to be defective. THIS WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EITHER EXPRESSED OR IMPLIED, AS TO DESCRIPTION, QUALITY, MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR USE, OR ANY OTHER MATTER. Under no circumstances shall Seller be liable to Buyer or any third party for any loss of profits or other direct or indirect costs, expenses, losses or consequential damages arising out of or as a result of any defects in or failure of its products or any part or parts thereof or arising out of or as a result of parts or components incorporated in Seller's equipment but not supplied by the Seller.

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