MILLER LEAMAN INC

Pure Filtration Solutions.

- *Thompson* Strainer
- *Turbo-Disc* Side-Stream Skid Systems
- *Turbo-Disc* Full Flow Systems
- *Helix* HD & HS Series Filters

Catalogue Registration Form

The information requested in this form will be used to update the information we have on record for you. The information you provide will be for internal use only. This will enable us to send you periodic updates to the catalogue with our most current product information.

Please provide us with the following information.

Company Name:	
First Name:	
Last Name:	
Street Address:	
City:	
State:	
Zip Code:	
E-Mail Address:	
Phone Number:	
Fax Number:	

Comments:	

MLIC-IND04

**Please detach at dash line and return to Miller-Leaman, Inc. to complete Catalogue Registration. The completed information can be faxed to (386) 248-3033 or mailed to Miller-Leaman, Inc., 800 Orange Avenue, Daytona Beach, FL 32114

MILLER LEAMAN INC
Pure Filtration Solutions.

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phone 386.248.0500 • toll free 800.881.0320
fax 386.248.3033 • www.millerleaman.com

THANK YOU…for considering our innovative filtration products. This catalogue is designed to give you all the necessary information to promote our filtration products. If you find that you need additional information, or clarification on information that you see, please do not hesitate to contact us.

In addition to the exceptional quality of our products, customer satisfaction is our highest priority. There are many filtration manufacturers competing in our market; therefore, we will endeavor to differentiate ourselves by offering unique products backed by a dedication to customer satisfaction.

For additional information please visit our website at www.millerleaman.com. On our website, you will find extensive technical information including 3D model drawings, product owner's manuals, and other valuable information.

We would appreciate the opportunity to assist you with any filtration applications you are working on. Our toll free number is 1-800-881-0320. You can also e-mail us at sales@millerleaman.com. We look forward to building a long-lasting, mutually beneficial relationship with your company.

Expect the Best,

Chris Shuster
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Vice President, Sales & Marketing

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MILLER LEAMAN INC

Pure Filtration Solutions.

Product Information Overview

Rev.061609

THOMPSON Strainer

MILLER-LEAMAN INCORPORATED

TOWER GUARD

HELIXAIR

turboDisc

MAXIM




"Your Source for Innovative Filtration Solutions"

MILLER-LEAMAN INCORPORATED

About Us…

- Founded in 1991
- Headquarters in Daytona Beach, FL
- State-of-the-art manufacturing facility (over 52,000 sq. ft.)
- Building listed in National Register of Historic Places

Products

Thompson Strainer

- •Screen Filtration
- • 2-Dimensional Filtration
- • 2”– 10” Connections
- •10 to 2000-GPM
- • Instrumentation Options

Automatic Turbo-Disc Filtration

- • Totally Automatic, Turn-key Systems
- • Full-Flow/Side-Stream and Slipstream Filtration
- • 3-Dimensional Filtration
- • NPT, Victaulic, Flange Connections
- • Modular, engineered systems

Helix Series Filters

- • Full-Flow/Side-Stream Filtration
- • 3-Dimensional Disc Filtration or Screen Filtration available
- • NPT or Victaulic Connections
- • HD Series Disc Cartridge
- • HS Series Screen Cartridge
- • Multiple Unit Manifold Arrangements

MAXIM Controller

- • State-of-the-art Controller
- • LCD Display Screen
- • Adjustment & Activation Keys
- • Menu Scrolling Buttons
- • NEMA-4X Enclosure
- • EEPROM Memory Chip

TowerGuard Sand Filter

- • Robust Polyester Vessel
- • Turn-Key Systems
- • Single Point Electrical
- • Optional Source or City water for backflush
- • Stainless Steel Frame/Skid

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Thompson Strainer

- • High Surface Area
- • Low Pressure Drop
- • Low Maintenance Design
- • High Quality Stainless Steel Construction
- • 2”- 10” Connections (NPT / Flanged)
- • V-Band Clamp or Bolted Lid Enclosures
- • Flush Reservoir While On-Line

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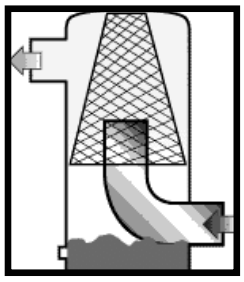
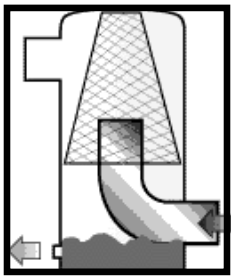
Flow Path



Filtration Mode



Flush Mode

- Flow enters through inlet at bottom of housing
- Upward flow through riser pipe assembly
- “Hydraulic” action and gravity accelerate heavier particulate to collect in reservoir
- Lighter contaminants (low specific gravity) are captured by conical screen
- Clean water exits through outlet port at top of housing
- Standard gauge ports for monitoring pressure differential across screen
- Collected particulate is flushed from reservoir without interrupting flow

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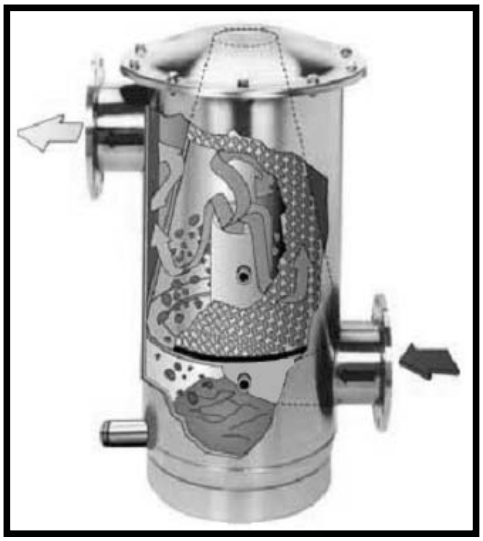
Materials of Construction



Housing (All Models):

- T304 Stainless Steel Standard
- T316 Stainless Steel Optional

Filter Elements:

- Screen Frames: T304 Stainless Steel
- Screen Mesh: T316 Stainless Steel

Internal Piping:

- 2" & 3" Models: T304 Stainless Steel Riser Pipe (Bottom Inlet)
- 4" through 10" Models: PVC Elbow and Riser Pipe Assembly (Side Inlet)
- Stainless Steel or CPVC Internals Are Optional

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Materials of Construction

Gaskets:

- EPDM standard
  (other compounds are available by special order)
- Gaskets Include: Lid Gasket, Disk Gasket
  and Filter Gasket (bottom of conical screen)

Band Clamp Assembly (2"-4" Models Only):

- Clamp and Handle: T304 Stainless Steel

Bolted Lid Assembly (4"-10" Models):

- Lid: T304 Stainless Steel
- Bolt, Washer and Nut: Grade 5 Zinc Plated

Pressure Gauge Ports (All Models):

- T304 Stainless Steel 1/4" FNPT
- Gauges Not Included

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Surface Area Data

MODEL	MAX GPM	SCREEN SURFACE AREA	INLET/OUTLET SIZE/STYLE	FLUSH PORT SIZE	LID TYPE	MAX PSI
MLS-2	100	122 sq. in.	2" Male NPT	1 ½"	Clamp	125
MLS-3	200	200 sq. in.	3" Male NPT	1 ½"	Clamp	125
MLS-4C	350	367 sq. in.	4" Flanged	1 ½"	Clamp	125
MLS-4B	350	367 sq. in.	4" Flanged	1 ½"	Bolt	150
MLS-6	750	745 sq. in.	6" Flanged	1 ½"	Bolt	150
MLS-8	1,300	1,559 sq. in.	8" Flanged	1 ½"	Bolt	150
MLS-10	2,000	2,434 sq. in.	10" Flanged	1 ½"	Bolt	150

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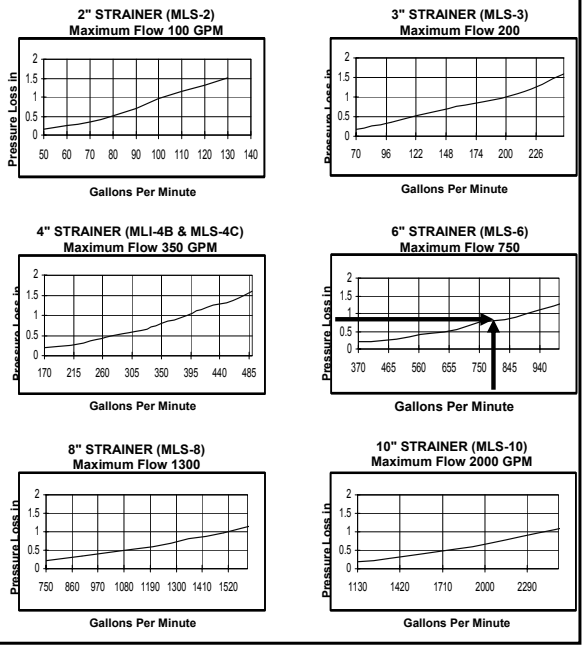
Low Pressure Drop

- All Models Designed For Less Than 1 PSID At Max Rated Flow
- Non-torturous Flow Path
- Less Energy Consumption
- Reduced Operating Costs



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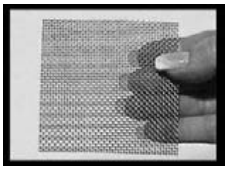
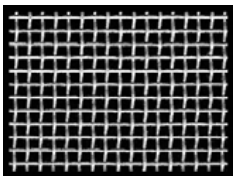
Mesh/Micron Options

MESH / MICRON DATA SHEET
STANDARD MESH OPTIONS

Mesh	Opening (inches)	Microns	Wire Diameter (inches)	Open Area
16	0.0395	1003	0.023	39.90%
30	0.0203	**516**	0.013	**37.10%**
40	0.015	381	0.01	36.00%
50	0.011	279	0.009	30.30%
60	0.0092	234	0.0075	30.50%
80	0.007	178	0.0055	31.40%
100	0.0055	140	0.0045	30.30%
120*	0.0046	117	0.0037	30.70%
150*	0.0041	**104**	0.0026	**37.40%**
200*	0.0029	74	0.0021	33.60%





HEAVY-DUTY MESH OPTIONS

24 x 110 (~120 Mesh)	0.0045	112 - 117	.014 / .010	N/A
30 x 150 (~150 Mesh)	0.0039	**95 - 100**	.009 / .007	**N/A**
40 x 200 (~200 Mesh)	0.0030	72 - 77	.007 / .0055	N/A
50 x 250	0.0024	55 - 60	.0055 / .0045	N/A

Mesh/Micron Conversion Formula

Microns = opening in inches / .00003937

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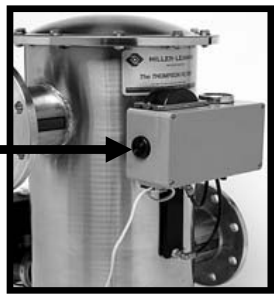
Instrumentation Packages

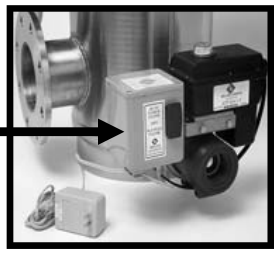
Pressure Differential Alarm (PDA)

- Monitors inlet and outlet pressures
- Signals screen cleaning is required
- Audible alarm
- Visual alarm
- Dry contacts (for remote monitoring)



Automatic Timer Flush (ATF-EA-1.5)

- Automatically purges reservoir
- Adjustable flush frequency
- Adjustable flush duration
- Manual flush over-ride



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Sample Specification

Thompson Strainer

Supplier shall provide _____ (qty.) strainers. Strainer shall be designed for a flow of _____ GPM, with a maximum pressure loss during maximum flow of 1 psi. Strainers shall be provided with a _____ mesh/micron filter element, conical in shape and vertical in orientation. Construction of the strainer housing, flanges, nipples and screens shall be of type 304 stainless steel. Strainers shall be provided with 1/4" gauge ports on inlet and outlet sides of screen and with a 1½" flush port integral to the operation of the strainer. Strainer housing shall be rated for 125/150 psi operation. Strainers shall be constructed by Miller-Leaman, Inc. or approved equal.

Automatic Timer Flush (ATF-EA-1.5)

The ATF shall insure that the particulate that accumulates in the debris reservoir of the filter/strainer is automatically flushed. The ATF shall be provided with a stainless steel ball valve, open/close indicator, and a controller to provide a field adjustable time flush. The power supply and timer controls for the valve are to be housed in NEMA 4X control box. The controls shall include a manual override switch for manually flushing and draining the filter before cleaning. Voltage 120V, the ATF-EA-1.5 shall be constructed by Miller-Leaman, Inc. or approved equal.

Pressure Differential Alarm (PDA)

The PDA option continuously monitors the inlet and outlet system pressure. The PDA will insure that when the filter requires manual cleaning an audible siren and visual flashing alarm is energized. The PDA will be provided with nipples, pressure differential gauge and a controller to provide an audible and visual announcement of pressure differential pressure above set point alarm. The PDA shall provide auxiliary dry contacts status of pressure differential alarm for remote monitoring (i.e. building automated system). The PDA shall also provide an alarm reset button. Voltage 120V, the PDA shall be constructed by Miller-Leaman, Inc. or approved equal.

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Summary

- Patented, Low Maintenance Design
- High Surface Area
- Low Pressure Drop
- Removes Low Specific Gravity (Lightweight) Contaminants
- On-Line Flushing / Uninterrupted Flow
- Performance Not Dependent on Flowrate, Pressure or Velocity
- High Quality Stainless Steel Construction
- Space Saving Profile
- Reduces Operating Costs
- Models Available for Flows From Under 100 GPM to 2000 GPM
- Manifold Arrangements Available for Higher Flows

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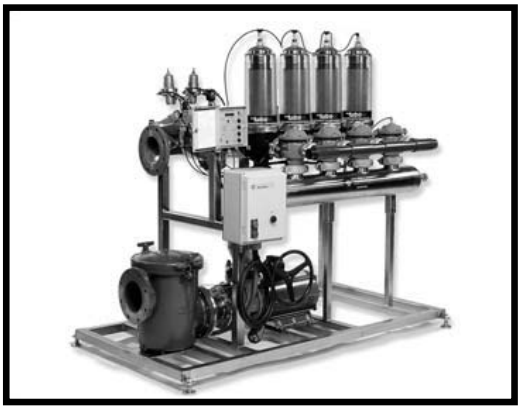
Automatic TurboDisc Filter

Sets a New Standard for Cooling Water Filtration

- Totally automatic operation
- Full flow, side- stream, or slipstream configurations
- 3-dimensional (depth) filtration
- Modular design
- Uses a fraction of the backflush water used by conventional sand filters
- Effectively removes particulate and light-weight, airborne contaminants (cottonwood seed, algae,etc.)



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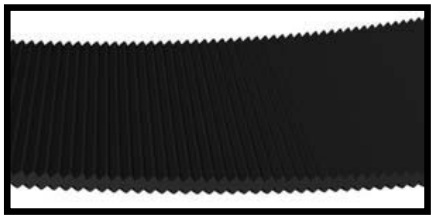
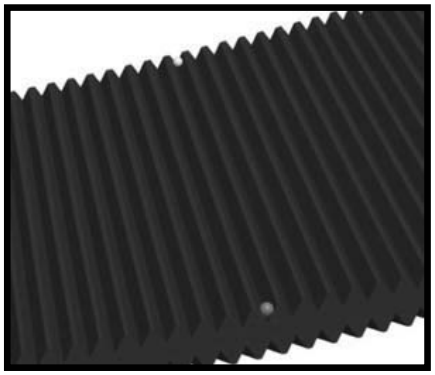
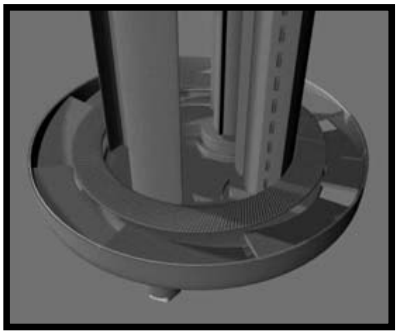
Polypropylene Discs







- Grooves On Both Sides of Discs
- Grooves Narrow Towards Center
- Grooves Cut on Angle

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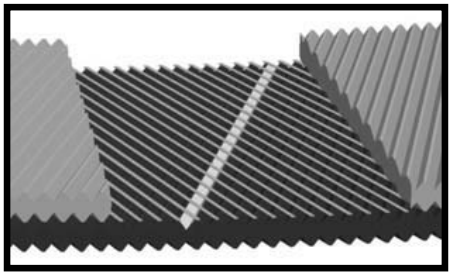
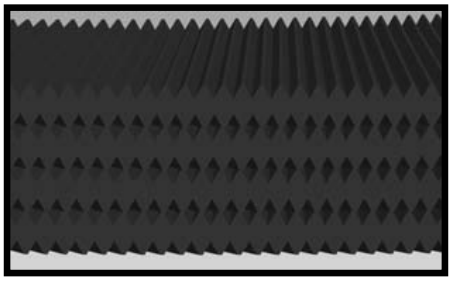
Disc Stack





- Angle of Grooves Results in "Cross Hatching" When Stacked
- Stacking of Discs Creates Pores and Torturous Path for Flow
- Disc Stack Provides 3 Dimensional, "Depth" Filtration

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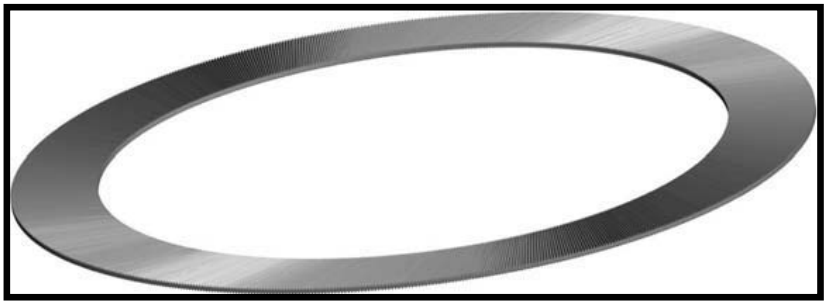
Disc Options



Several Color-coded Disc Options:

50 micron

100 micron

130 micron

200 micron

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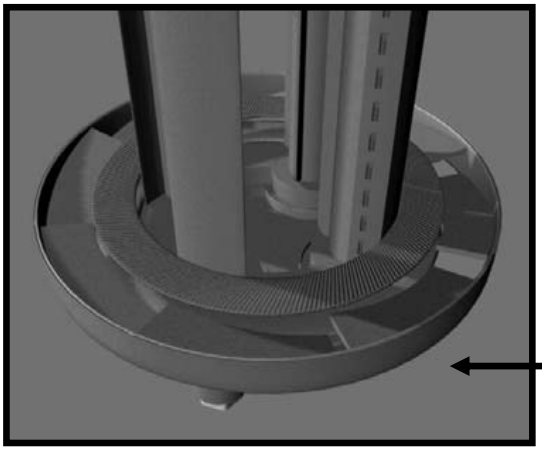
Turbo Element



MLI turboDISC

Turbo-Element

The patented Turbo-Element creates a centrifugal action, spiraling heavier particulate away from the disc stack. This dramatically reduces the backflush frequency and minimizes the backflush water consumption. This not only saves water, but reduces chemical usage as well.

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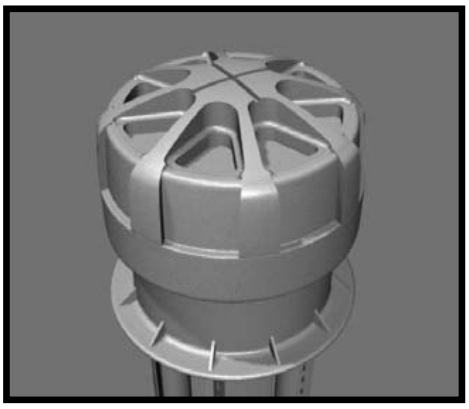
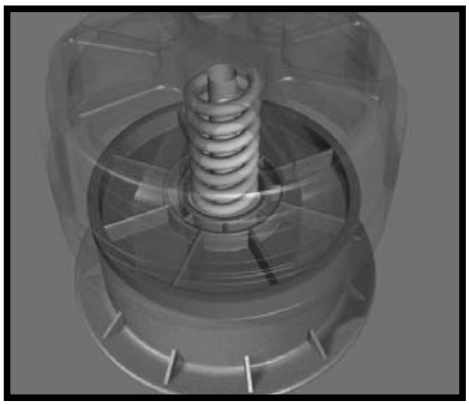
Spring Loaded Cap Assembly





The spring loaded cap keeps the disc stack compressed tightly until backflush mode begins.

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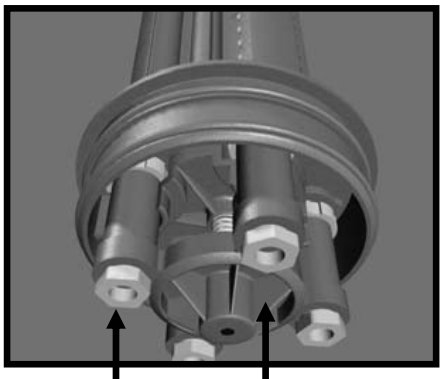
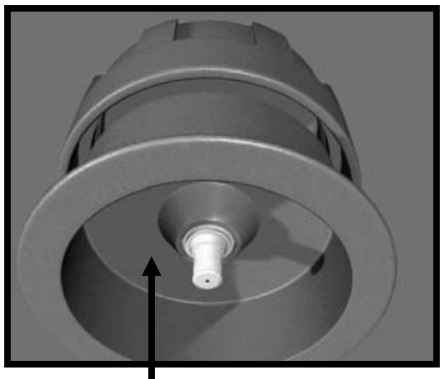
Reversing Flow Direction





Check valve – closes during backflush mode

Riser post openings - water enters here during backflush

Pressure is applied to bottom side of cap to decompress disc stack during backflush

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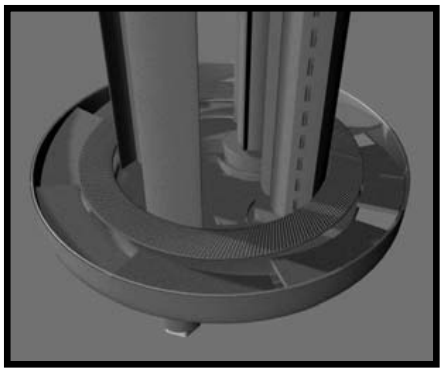
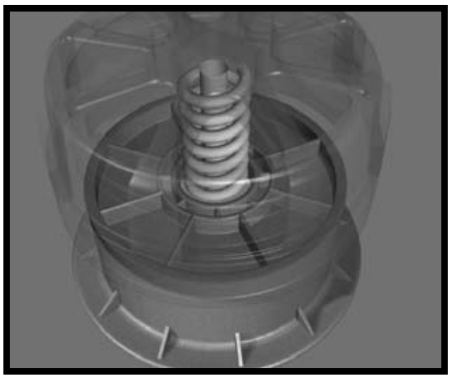
Decompressing Disc Stack





Once the top cap has lifted, pressure is removed from the disc stack which allows the discs to separate enhancing the cleaning during backflush

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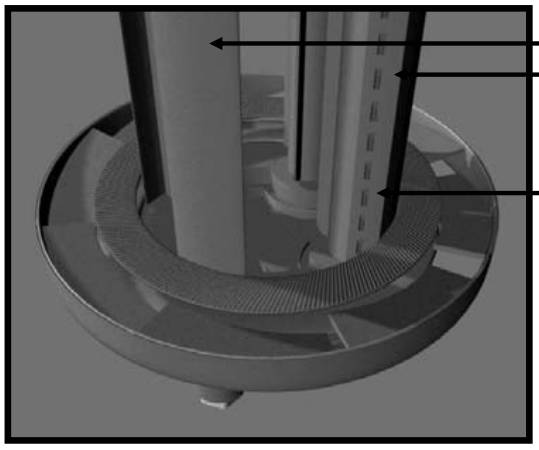
Backflush Mode



During backflush, water sprays from the 120 openings in a tangential direction to the discs. This causes the discs to spin during backflush, enhancing the backflush efficiency.

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Technical Data

- Polyamide Housing rated at 125 PSI, 140°F, and 400 psi burst pressure
- Polyamide Turbo-Element, Riser Posts and Check Valve
- Polypropylene Disc Filter Media
- EPDM Static Gaskets
- Teflon impregnated Viton (cap o-ring)
- 316 Stainless Steel Clamp
- 200, 130, 100 and 50 micron disc options

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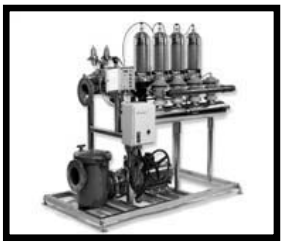
Packaged Systems



- Automatic Operation
- Disc Filter Pods
- Stainless Steel Inlet/Outlet Manifolds
- Automatic Back Flush Valves/Solenoids
- *"Maxim"* Back Flush Controller
- Single Point Electrical Connection
- Stainless Steel Frame and Skid Assembly
- Air Override Feature
  (air enhances backflush efficiency)
- Systems shipped pre-wired, tested, and completely assembled.

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Sample Specification

•Supplier shall provide an automatic side-stream disc filter system **(Model # _____)**. The system should be supplied complete with a pump on a stainless steel skid assembly. The filter system shall be designed for a flow rate of _____ GPM.

•The filter disc cartridges shall consist of a compressed stack of polypropylene ring discs, installed vertical in orientation. Each individual disc shall be 5.125 inches in outside diameter and 4.010 inches in inside diameter. Each complete disc cartridge has an external filter surface area of at least 228 square inches and a minimum volume of 113 cubic inches.

•Intrinsic to the design, the filter shall incorporate a fluid spinning turbine mechanism inside the filter housing that generates a centrifugal effect. This effect will spin heavier particulate to the outer wall of the filter housing, away from the disc stack located in the inner portion of the housing. The dirty water will pass through the disc media from the outside to the inside, capturing lighter contaminants on the surface of the discs and through the depth of the discs. Due to this centrifugal effect, in combination with the three-dimensional disc media, the filter will remove XXX-micron particles or smaller. These results are achieved by a caking effect building on the disc media, as the water continuously passes through the side-stream system.

•Filters shall backflush by decompressing the disc stack and focusing a clean water backwash spray tangential to the inner diameter of the disc stack. The spray will cause a spinning action that will clean the individual discs. Backflush flow direction shall be from the inside of the cylinder to the outside. The backflush spray shall be applied via [4] rigid backwash columns that focus the spray at fixed indexed heights on the disc stack. Manifold piping shall be constructed of stainless steel.

•Filter shall be provided fully assembled and tested. Filter shall be constructed and assembled by

•Miller-Leaman, Incorporated or approved equal.

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Sales Tools

Demo Trailer

Our Demonstration Trailer is equipped with a 3-Pod ATD Filtration System complete with a 150 gallon water reservoir or it can be connected to an external water source. No external utilities are required to operate our trailer.

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Benefits

- Totally automatic operation
- Uses a fraction of the backflush water used by conventional sand filters
- Small footprint
- Custom designs to suit any application
- Multiple disc selections (50, 100,130, 200 microns)
- Corrosion resistant materials of construction
- No special tools required for maintenance

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Manual Helix Series Filters

Helix HD Series
(disc cartridge)

- 3 Dimensional Disc Filtration
- Several Disc Options (micron size)
- Ideal for Soft or Organic Contaminants
- Economical

HELIX

Helix HS Series
(screen cartridge)

- Several Mesh Options
- Ideal for Coarse Filtration
- Economical

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Flow Path

- Water enters the filter housing. (**Red Arrows**)
- High velocity centrifugal action occurs, spiraling heavier particles (sand, sediment, etc.) away from the disc/screen cartridge, down to the base of the filter. (**Yellow Arrows**)
- These accumulated particles are then flushed from the filter via the ¾" flush port connection at the base of the filter lid.
- Clean water exits outlet. (**Green Arrows**)

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Surface Area

Model	Type	Surface Area
HD/HS 2"	Regular	186 sq. in.
HD/HS 2"	Super	263 sq. in.
HD/HS 3"	Regular	263 sq. in.

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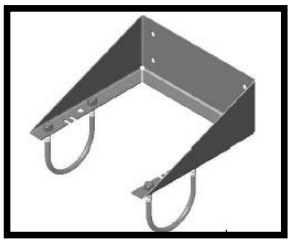
Technical Data

- Housing: Polyamide
- Rated at 125 psi and 140º F
- Burst Pressure 400 psi
- Discs: Polypropylene
- Screens: 316 Stainless Steel
- ¼ " FNPT Gauge Ports (gauges not included)
- Gaskets: EPDM
- Filter Pod Clamp: Stainless Steel (Type 316)
- Optional Stainless Steel Mounting Bracket



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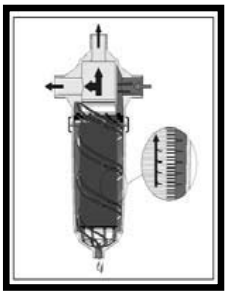
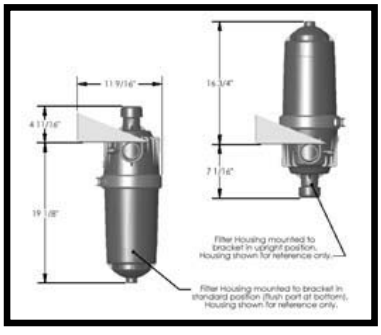
Helix Configurations

Inlet/Outlet Configurations:

- 2" and 3" models available with NPT or victaulic inlet/outlet connections
- In-line and 90º configuration standard (cap supplied for outlet port not in use)
- Multiple pods may be manifolded for larger flows
- Optional wall mounting bracket assembly





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Helix Summary

- Centrifugal cleaning action minimizes maintenance
- Large surface area
- Particles can be flushed while filter is in operation
- Several options for disc and screen sizes
- Durable, corrosion resistant injection molded housing
- Easily removable, quick release clamp lid assembly
- Pressure gauge ports molded into housing
- No tools required for maintenance

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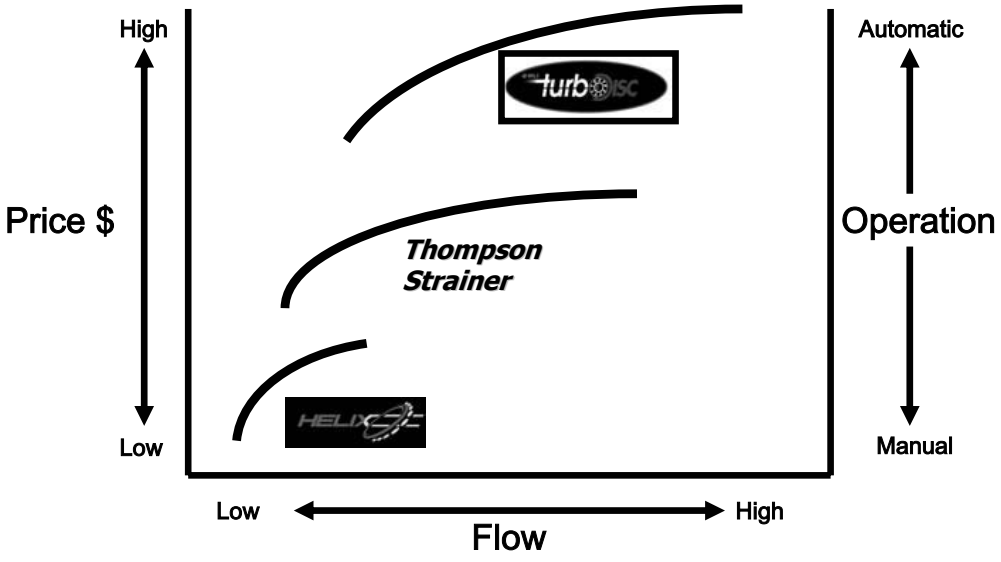
Product Positioning



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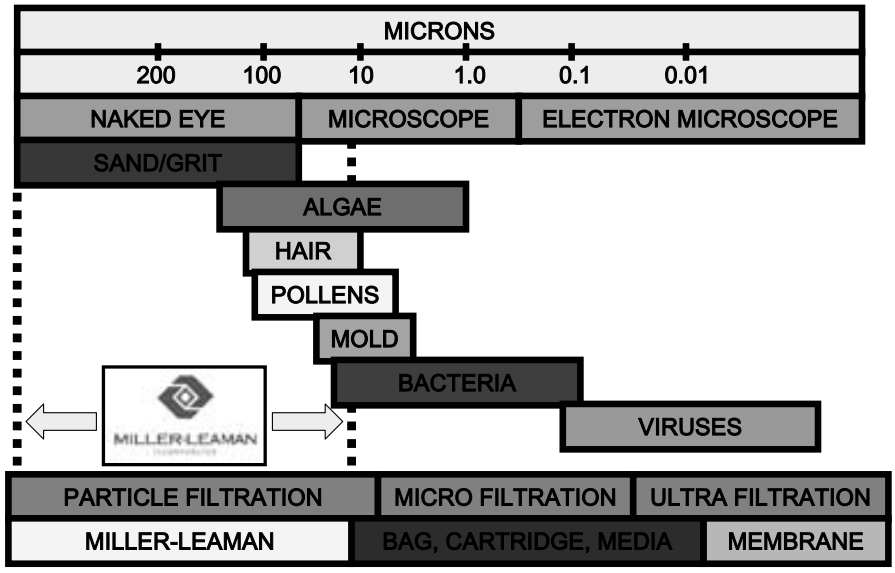
Filtration Spectrum



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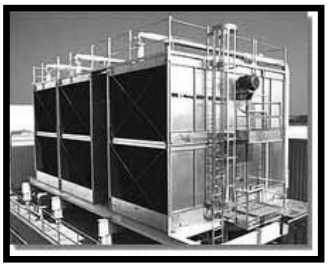
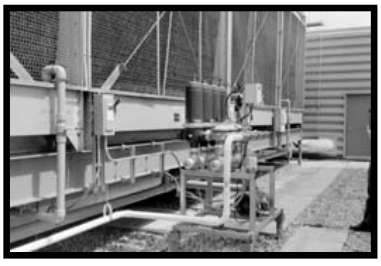
Applications - HVAC

- Full flow, side-stream, and slip-stream filtration of cooling tower water
- Protection of chillers, heat exchangers, condensers, and other “wet side” components
- Process cooling or chilled water filtration





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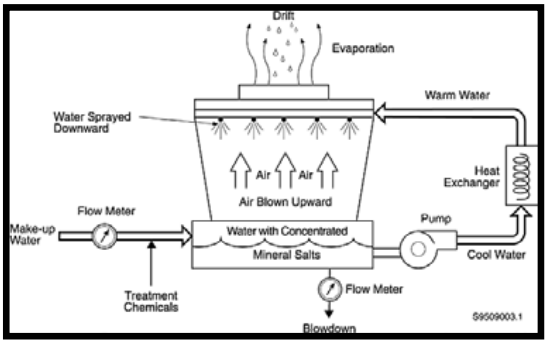
The Problem

- Cooling towers continuously scrub contaminants from the air
- Particulate can fouls heat exchangers, condenser tubes and other equipment
- Evaporation leads to concentration of contaminants
- Particulate provides a “breeding ground” for biological growth



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The Problem (con’t)

How do the contaminants get into the water?

Source #1:

- Cooling towers are excellent air scrubbers
- A typical 400 ton cooling tower moves over 100,000 CFM of air
- The contaminants collect in the cooling tower basin and other downstream components
- Increased use of “Free Cooling” means more run hours (more air / more contaminants)

Source #2:

- The circulating water contributes solid contaminants
- Slime, algae, chemical residue, and calcium carbonate can all be found in cooling tower water
- Particulate in make-up water

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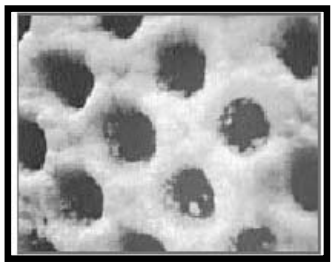
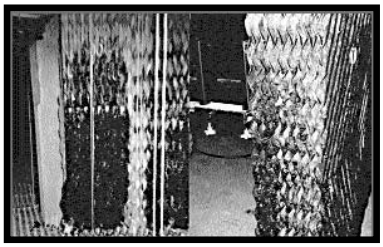
Consequences

- Reduced operating efficiency
- Increased downtime
- Costly repairs
- Higher water treatment costs (chemicals)
- Shortened equipment life





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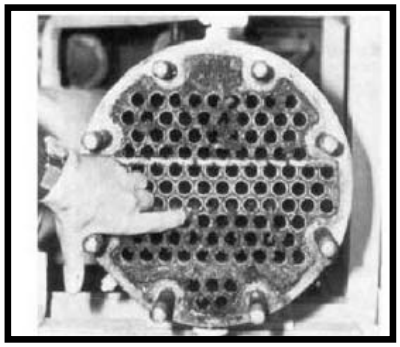
Consequences (con't)

Why is it important to remove solid contaminants?

- Solid contaminants will increase fouling factor
- An increase of 0.001 in fouling factor increases energy consumption by 10%
- Cooling tower life is typically determined by the life of the basin
- A layer of solid contaminants in the basin prevents penetration of corrosion inhibitors and other chemicals
- A solid contaminant layer is an excellent "breeding ground" for bacteria and algae
- Particulates can clog heat exchangers and spray nozzles, degrading flow distribution
- Clogged nozzles require maintenance and possible shutdown



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The Solution

Proper Filtration of Cooling Water …

- Increase efficiency of heat transfer devices
- Extend equipment life
- Reduce biological problems
- Lower chemical treatment costs
- Reduce maintenance

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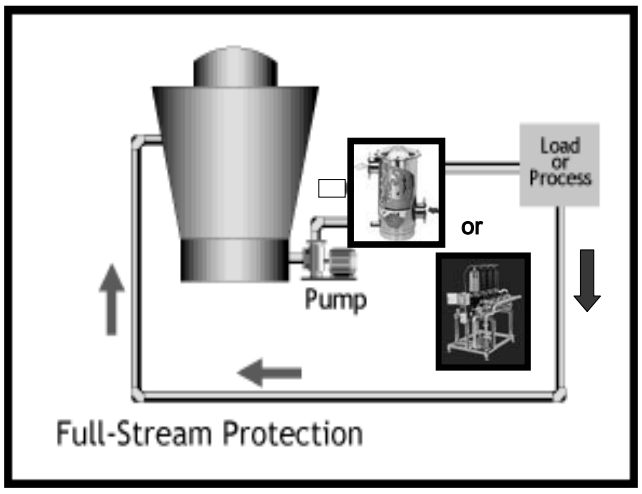
Full Flow Filtration

Pros

- Complete Protection
- Entire Flow is Filtered
- Utilizes System Pump

Cons

- Larger Filter Required
- More Costly



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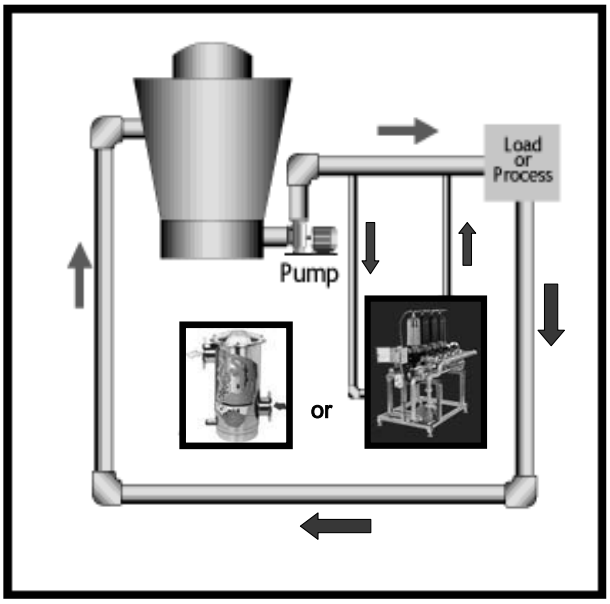
Slip-stream Filtration

Pros

- Smaller Flow Filtered
- Less Expensive
- Utilizes System Pump
- Installation Flexibility (location of filter)

Cons

- Does Not Filter Full Flow
- Does Not Address Tower Basin
- Pump Must Have Sufficient Capacity



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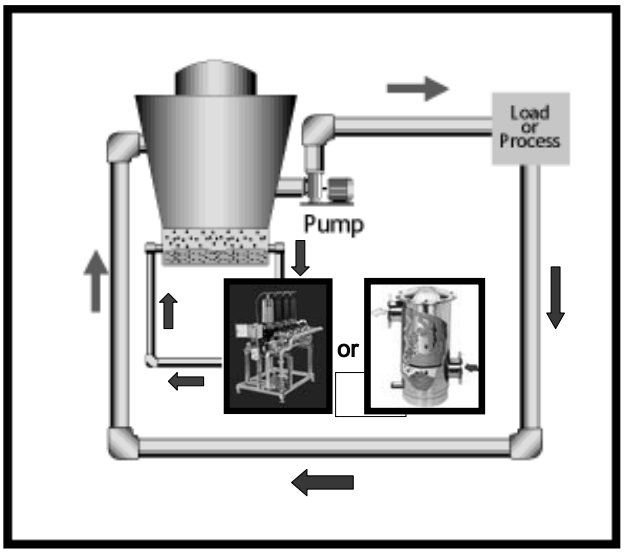
Side-Stream Filtration

Pros

- Smaller Flow Filtered
- Less Expensive
- Cleans Tower Basin
- Most Effective Location (with Sweeper Piping)

Cons

- Does Not Filter Full Flow
- Requires Additional Pump



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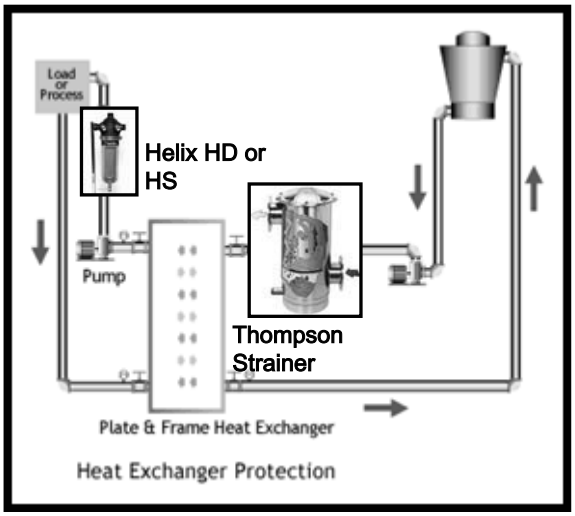
Point of Use Filtration

Use Thompson Strainers and Helix Filters To Protect:

- Heat Exchangers
- Chillers
- Condensers
- Machinery



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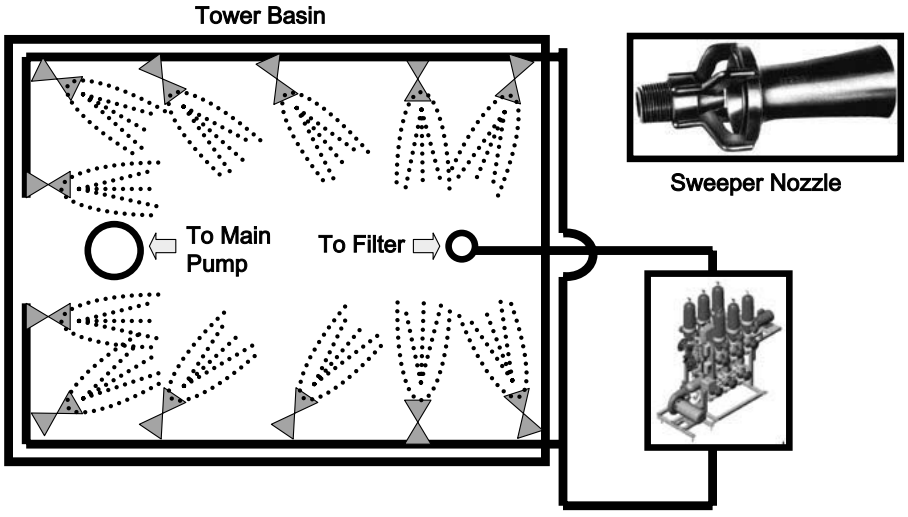
Sweeper Piping



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Selling Comparison

- Minimal Backflush Water Required (10-12 gal/pod)
- Low Operating Cost
- Small Footprint
- Easy Maintenance (no special tools required)
- Superior Materials of Construction

- High Backflush Water Consumption (full flow; 3-8 minutes)
- Drainage May Be An Issue
- Wasted Chemicals
- Large Footprint
- Sand Replacement Is Messy And Labor Intensive

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Selling Comparison

- High Surface Area
- Low Pressure Drop
- Removes All Types Of Contaminants Including Light Weight “Floaters”
- Effective On Cottonwood Seed, Bugs, Leaves, ETC.
- Stainless Steel Construction

- Flow Dependent For Proper Performance
- Only Effective On Heavy Particulate (greater than 1.2 specific gravity)
- Light Weight “Floaters” Will Pass Through
- High Pressure Drop
- Conventional Materials of Construction

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Selling Comparison


- High Surface Area
- Screen or Disc Options
- Easy Maintenance (no tools)
- Longer Interval Between Cleanings
- Discs Are Ideal For Soft or Organic Contaminants
- Corrosion Resistant Materials
- Optional Instrumentation


- Small Surface Area
- Frequent Cleaning Required
- Not Effective On Organic or Extrudable Contaminants
- Conventional Materials of Construction
- No Instrumentation

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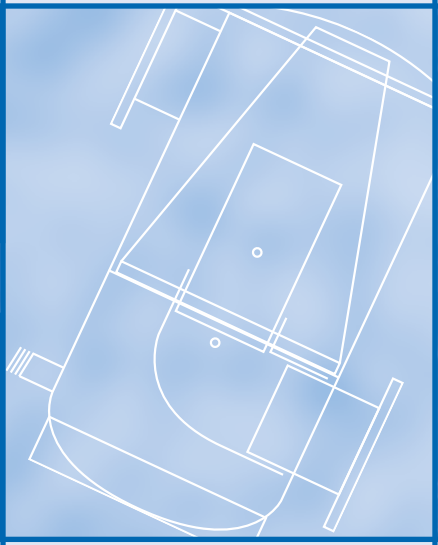
Why Miller Leaman?

- Experienced, Field-proven Filtration Solutions
- Unique, Patented Technology
- Innovative Designs
- High Quality Manufacturing
- Responsive, Technical Factory Support
- Customer Focused Sales Organization




Thompson Strainer
Information & Owner's Manual

THOMPSON Strainer



The Thompson Strainer is a unique, yet brilliantly simple product, used in a variety of applications to remove particles from water and other liquids.

Available in Type 304 and Type 316 stainless steel construction, the patented design features a large conical screen element with substantially more surface area compared to traditional strainers on the market.

You can select the screen that meets your needs. A large variety of screen options are available, ranging from large perforated hole-openings down to 250-mesh (approximately 50-micron).

The Thompson Strainer's internal flow patterns force heavy particles down to the large reservoir at the base of the strainer. The particles are then purged from the strainer via the flush port, either manually, or automatically with the optional **Automatic Timer Flush Package (ATF-EA-1.5).**

The Thompson Strainer is exceptionally efficient; all models operate with less than a 1 PSI pressure loss at maximum flow, when clean. Strainer housings come standard with two gauge ports, allowing maintenance personnel to monitor the differential pressure across the internal screen. The optional **Pressure Differential Alarm Package (PDA)** will alert maintenance personnel if the conical screen needs to be removed for manual cleaning.

At Miller-Leaman, we take pride in innovation and workmanship. Efficient, clean design. Highly polished stainless. Rigorously tested welds. Technically adept customer service technicians. Superior technology and made in the USA.

- **FLUSH PARTICLES ON-LINE, VIA BOTTOM FLUSH PORT**
- **GREATER SCREEN SURFACE AREA, REDUCES MAINTENANCE**
- **LESS THAN 1 PSI PRESSURE LOSS, MINIMIZING SYSTEM OPERATING COSTS**
- **SIMPLE DESIGN, NO MOVING PARTS**
- **SPACE SAVING PROFILE TO FIT TIGHT SPACES**
- **HIGH QUALITY STAINLESS STEEL CONSTRUCTION**

TYPICAL APPLICATIONS INCLUDE:

- Cooling Tower / Chilled Water
- Well Water / Surface Water
- Process Water
- Wastewater / Reclaim Water / Municipal Water
- Mining Applications
- Chemical Processing
- Food / Beverage Applications (Sanitary Design)
- Spray Nozzle Protection
- Marine (Seawater)
- Agricultural Applications (Irrigation / Liquid Fertilizer)

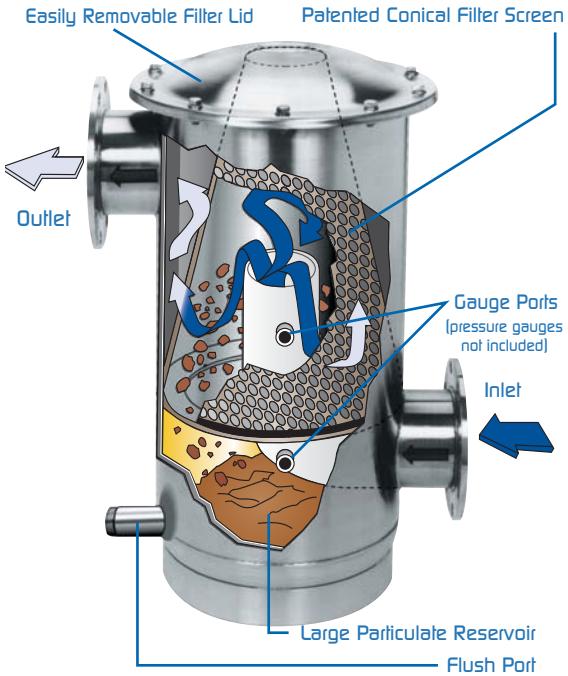
U.S. Patent #5,132,013; International Patents Pending

The shape and size of the conical screen are what make the Thompson Strainer more functionally efficient than the competition.

As water enters the bottom of the strainer housing and flows upward, heavier debris and particulate is accelerated downward, away from the conical screen, into the sizable reservoir at the base of the strainer. The particulate is then flushed from the reservoir, under pressure, via the 1 ½" flush port, without interrupting downstream flow. The top lid of the strainer is easily removed if the internal screen requires manual cleaning.

Due to the non-torturous flow path through the strainer, in combination with the generous amount of surface area on the conical screens, all models operate with less than a 1 PSI pressure drop.

The Thompson Strainer can be customized to fit your specific needs.



CONSTRUCTION MATERIALS

Housing & Internal Piping:

Type 304 Stainless Steel (Type 316 is optional)

4"-10" models come standard with internal PVC elbow and riser pipe assembly; stainless steel internal piping is available by special order.

Internal Conical Screen Elements:

Screen Support Frames:

Type 304 Stainless Steel (Type 316 is optional)

Screen Mesh:

Type 316 Stainless Steel is standard

Gaskets:

EPDM is standard; other compounds are available by special order

Lid Fasteners:

Clamp Lid Models:

Clamp is type 304 stainless steel

Bolted Lid Models:

Grade 5 bolts/nuts; zinc plated washers

SCREEN SIZES AVAILABLE

Mesh Options:

16, 20, 30, 40, 50, 60, 80, 100, 120, 150, 200

24x110*, 30x150*, 40x200*, 50x250*

*Heavy-duty Dutch-weave screens (lower open area %)

Perforated Options:

1/4", 1/8", 1/16"

Other mesh and perforated options available by special order

Model #	Inlet/Outlet Size & Type	Max Flow* (GPM)	Max Pressure Rating***	Lid Closure Type	Gauge Ports****	Flush Port****
MLS-2	2"/NPT	100 GPM	125 PSI	CLAMP	1/4" FPT	1 ½" NPT
MLS-3	3"/NPT	200 GPM	125 PSI	CLAMP	1/4" FPT	1 ½" NPT
MLS-4C	4"/FLANGED	350 GPM	125 PSI	CLAMP	1/4" FPT	1 ½" NPT
MLS-4B	4"/FLANGED	350 GPM	150 PSI	BOLTED	1/4" FPT	1 ½" NPT
MLS-6	6"/FLANGED	750 GPM	150 PSI	BOLTED	1/4" FPT	1 ½" NPT
MLS-8	8"/FLANGED	1300 GPM	150 PSI	BOLTED	1/4" FPT	1 ½" NPT
MLS-10	10"/FLANGED	2000 GPM**	150 PSI	BOLTED	1/4" FPT	1 ½" NPT

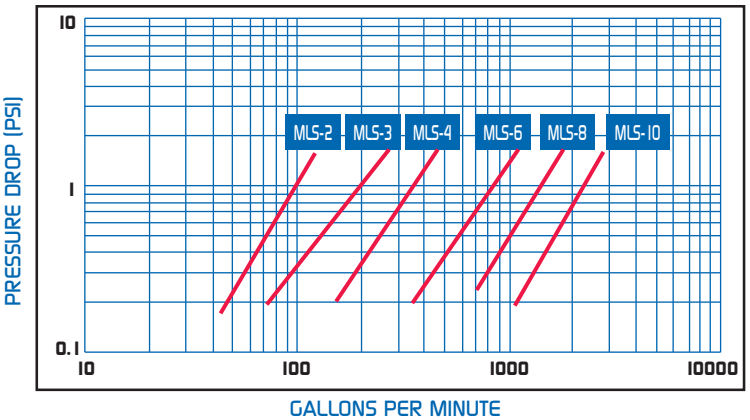
*Max flow varies depending on solids loading and screen sizing.

**Manifold multiple strainers for higher flow rates.

***High pressure models available by special order.

****Pressure gauges and flush valve not included.

PRESSURE LOSS CURVES



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www.millerleaman.com • Email: sales@millerleaman.com

Made in the U.S.A.

THOMPSON STRAINER

Data Sheet

Model	Max. GPM	Screen Surface Area	Inlet/Outlet Style	Flush Port Size	Lid Type	Maximum PSI
MLS-2	100	122 sq. in.	Male NPT	1 ½"	Clamp	125
MLS-3	200	200 sq. in.	Male NPT	1 ½"	Clamp	125
MLS-4C	350	367 sq. in.	Flanged	1 ½"	Clamp	125
MLS-4B	350	367 sq. in.	Flanged	1 ½"	Bolt	150
MLS-6	750	745 sq. in.	Flanged	1 ½"	Bolt	150
MLS-8	1,300	1,559 sq. in.	Flanged	1 ½"	Bolt	150
MLS-10	2,000	2,434 sq. in.	Flanged	1 ½"	Bolt	150

If you have any additional product related questions, please call us at (800) 881-0320.
Miller-Leaman, Inc. products undergo constant quality control and improvement evaluations.
The manufacturer reserves the right to make changes and improvements in the products without prior notice.

MORE TECHNICAL INFORMATION CAN BE FOUND ON OUR WEB SITE AT:
www.millerleaman.com

SAMPLE SPECIFICATION FOR THE THOMPSON FILTER/STRAINER

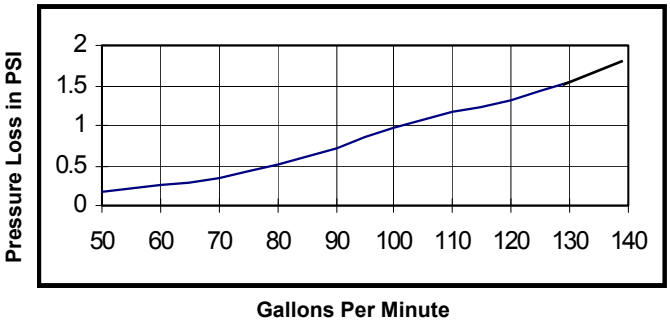
Supplier shall provide _____ (qty.) strainers. Strainer shall be designed for a flow of _____ gpm, with a maximum pressure loss during maximum flow of 1 psi. Strainers shall be provided with a _____ mesh/micron filter element, conical in shape and vertical in orientation. Pressure Construction of the strainer housing, flanges, nipples, and screens shall be of type 304 stainless steel. Strainers shall be provided with 1/4" gauge ports on inlet and outlet side of screen and with a debris flush port integral to the operation of the filter. Strainer housing shall be rated for 125/150 psi operation. Strainers shall be constructed by Miller-Leaman, Inc. or approved equal.

Revised 5/98

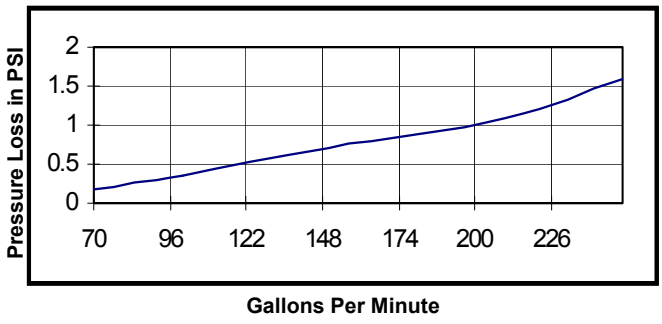
THOMPSON STRAINER
EFFICIENCY CURVES
INDUSTRY'S LOWEST PRESSURE DROP

All Thompson Strainers have been designed to operate with less than a 1 PSI pressure loss during maximum flow when clean. This exceptional efficiency results in less energy consumption and reduced operating costs. Call us today for a free energy savings

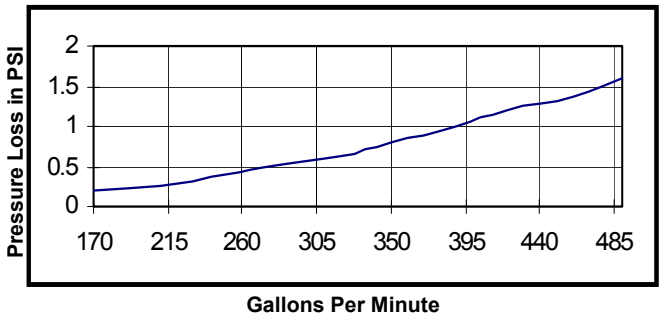
2" THOMPSON STRAINER (MLS-2)
Maximum Flow 100 GPM



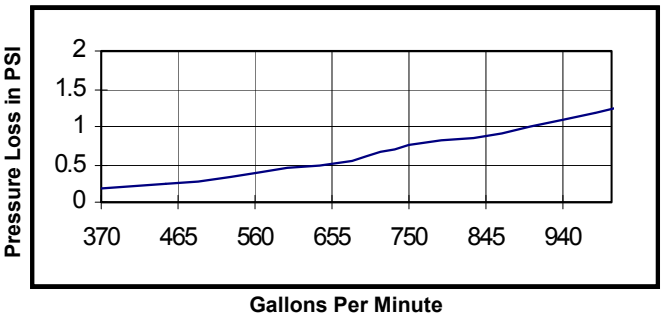
3" THOMPSON STRAINER (MLS-3)
Maximum Flow 200 GPM



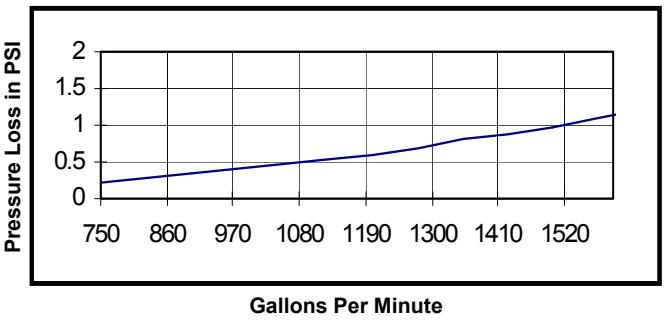
4" THOMPSON STRAINER (MLS-4B & MLS-4C)
Maximum Flow 350 GPM



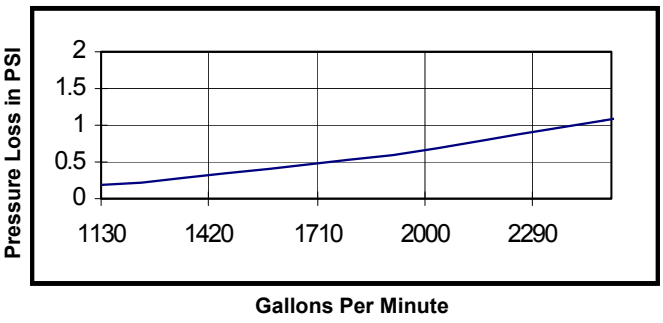
6" THOMPSON STRAINER (MLS-6)
Maximum Flow 750 GPM



8" THOMPSON STRAINER (MLS-8)
Maximum Flow 1300 GPM



10" THOMPSON STRAINER (MLS-10)
Maximum Flow 2000 GPM



**** ALL PRESSURE LOSS CURVES REFLECT STANDARD MESH SIZING OF 16 - 200 MESH.***

MILLER-LEAMAN
INCORPORATED

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FOR MORE TECHNICAL DATA ONLINE: www.millerleaman.com

MILLER-LEAMAN

INCORPORATED

800 Orange Avenue/Daytona Beach, FL 32114
Tel: (386) 248-0500 / Fax: (386) 248-3033
www. millerleaman.com

MESH / MICRON DATA SHEET

STANDARD MESH OPTIONS

Mesh	Opening (inches)	Microns	Wire Diameter (inches)	Open Area
16	0.0395	1003	0.023	39.90%
20	0.0340	864	0.016	46.20%
30	0.0203	516	0.013	37.10%
40	0.0150	381	0.01	36.00%
50	0.0110	279	0.009	30.30%
60	0.0092	234	0.0075	30.50%
80	0.0070	178	0.0055	31.40%
100	0.0055	140	0.0045	30.30%
120*	0.0046	117	0.0037	30.70%
150*	0.0041	104	0.0026	37.40%
200*	0.0029	74	0.0021	33.60%

HEAVY-DUTY MESH OPTIONS

24 x 110 **(≈120 Mesh)**	0.0045	112 - 117	.014 / .010	N/A
30 x 150 **(≈150 Mesh)**	0.0039	95 - 100	.009 / .007	N/A
40 x 200 **(≈200 Mesh)**	0.0030	72 - 77	.007 / .0055	N/A
50 x 250	0.0024	55 - 60	.0055 / .0045	N/A

***Miller-Leaman recommends the purchase of the heavy-duty mesh options as alternatives to the finer, more fragile standard screen options (120, 150, and 200 mesh). Be advised, however, that the heavy-duty mesh options have less open area percentage and will require more frequent maintenance in some applications.**

Mesh/Micron Conversion Formula
Microns = opening in inches / .00003937

Visit our website!
www.millerleaman.com

URGENT!

TO: Sales Department

MILLER-LEAMAN, INC.
Manufacturer of the
THOMPSON
STRAINER

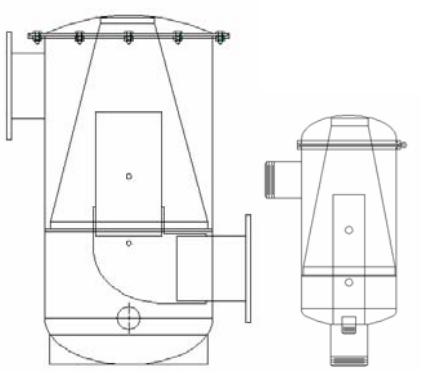
Fast Fax- Thompson Strainer

Fill out this fact form and your questions will be responded to by an application specialist ASAP. Fax this form to:

(386) 248-3033

Or, call us at 1-800-881-0320 for immediate assistance.

APPLICATION FACTS:



Liquid:_____ Temperature:_____

Flow Rate:_____ Line Size:_____

Operating Pressure:_____ Max Pressure:_____

Particle size to be filtered:_____Micron _____Mesh

Particle Concentration:_____Parts Per Million

Describe the particle (firm, soft, slimy,

etc.):_____

System Operation: Continuous or Batch

Is there a filter/strainer currently being used on this application? If so, what product is being used and how is it performing?_____

Why is filtration required?_____

Name_____ Title_____

Company_____ Phone_____

Address_____

City_____ State_____

Zip_____

MILLER-LEAMAN, INC.
800 ORANGE AVENUE
DAYTONA BEACH, FL 32114

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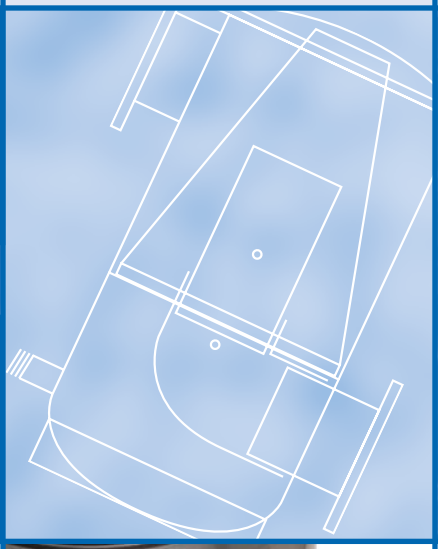
THOMPSON Strainer

INSTRUMENTATION PACKAGE OPTIONS



PRESSURE DIFFERENTIAL ALARM PACKAGE (PDA)

The Pressure Differential Alarm Package (PDA) continuously monitors the pressure drop across the internal conical screen. When the strainer screen becomes dirty, the switch-gauge triggers an audible and visual flashing alarm, intended to alert maintenance personnel when the screen needs to be removed from the housing for manual cleaning. At maximum flow, all Thompson Strainer models operate with less than a 1 PSI pressure loss (when clean). The alarm is factory set to engage when the differential pressure reaches approximately 7 PSID; however, this setting is adjustable by changing the set point contact at the base of the differential pressure gauge. The PDA package comes standard with auxiliary contacts for remote monitoring of the alarm. The PDA is housed inside a NEMA rated enclosure and comes with a 110V / 12VDC wall mount power supply.

AUTOMATIC TIMER FLUSH PACKAGE (ATF-EA-1.5)

The Automatic Timer Flush Package (ATF-EA-1.5) automatically purges particles that have gravitated down into the debris reservoir at the base of the strainer. Purging the reservoir; however, does not clean the internal screen (see above PDA explanation). Depending on the solids' loading of the application, the user simply dials in the FLUSH FREQUENCY (time between flushes) and FLUSH DURATION (length of flush) of the valve. The flush frequency is preset for (24) hours and the flush duration is preset for (8) seconds; these settings can be substantially changed. Based on the parameters programmed, the robust stainless steel ball valve opens and closes. The user can override the timer by engaging a manual flush cycle. The controller attached to the valve is housed inside a NEMA enclosure. If ordered with the PDA alarm package, an electrical cord from the PDA supplies power to the ATF-EA-1.5 valve package. If the ATF-EA-1.5 is ordered separately, a 110V / 12VDC wall mount power supply is included.

PRESSURE DIFFERENTIAL ALARM:

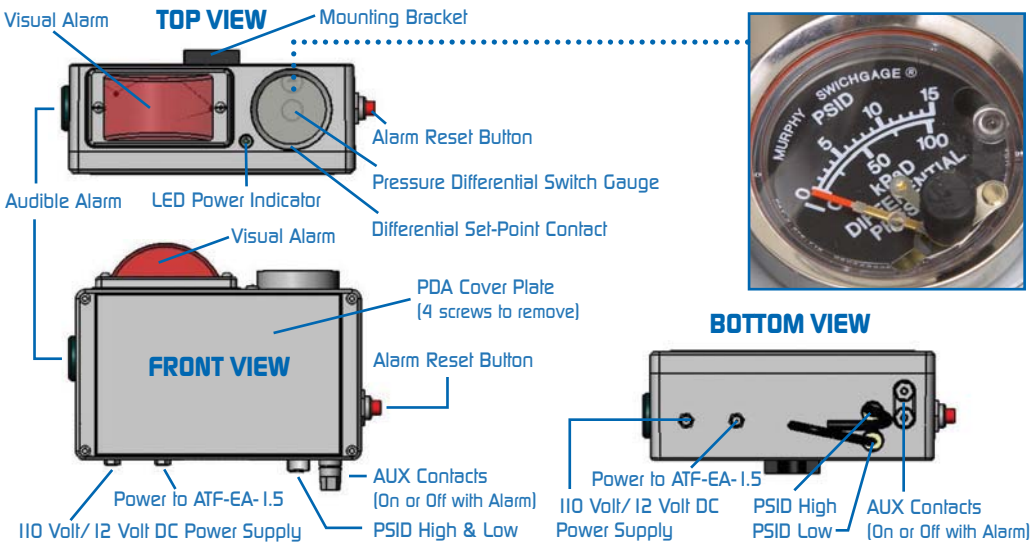
- Monitors Differential Pressure
- Signals When Screen Cleaning is Required
- Audible and Visual Alarm
- Auxiliary Contacts For Remote Monitoring
- Comes With Bracket for Mounting

AUTOMATIC TIMER FLUSH VALVE:

- Automatically Purges Particles from Bottom Reservoir
- Robust Stainless Steel Ball Valve
- Adjustable Flush Frequency and Flush Duration
- Manual Flush Override
- Valve Threads On Strainer Flush Port

PRESSURE DIFFERENTIAL ALARM PACKAGE (PDA)

PRESSURE DIFFERENTIAL ALARM PACKAGE COMPONENTS



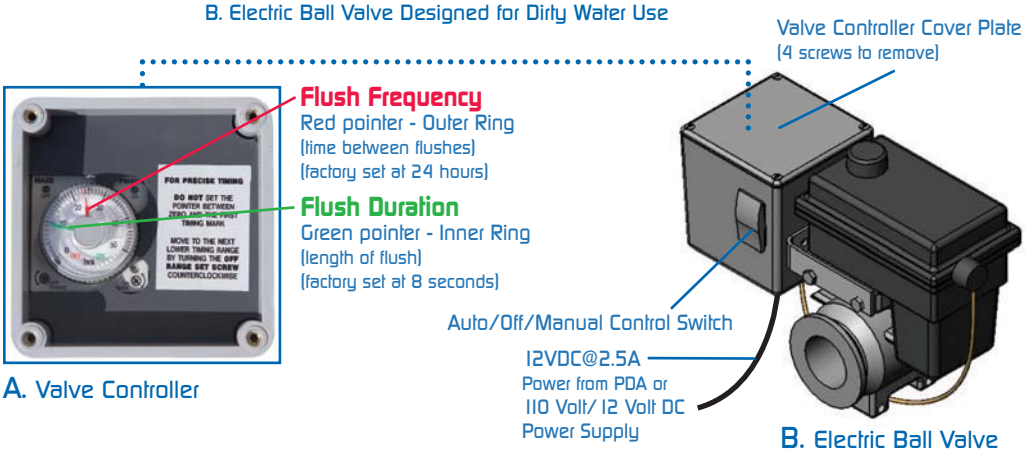
AUTOMATIC TIMER FLUSH PACKAGE (ATF-EA-1.5)

AUTOMATIC TIMER FLUSH PACKAGE COMPONENTS

System Components: A. Valve Controller

- Adjusts flush duration (length of flush) and the flush frequency (time between flushes)

B. Electric Ball Valve Designed for Dirty Water Use



FLUSH VALVE SHOULD BE PLUMBED TO DRAIN WITH 1 ½" (OR LARGER) PIPING.
FLUSH LINE SHOULD NOT BE PIPED TO A PRESSURIZED LINE.

PART NUMBER	DESCRIPTION	ELECTRICAL
PDA	Pressure Differential Alarm Package (comes with mounting bracket to mount on strainer)	Comes with 110V/ 12VDC Power Supply
ATF-EA-1.5*	Automatic Timer Flush Package - (Threads on 1 ½" Flush Port) - For use on all Thompson Strainer models: MLS-2, MLS-3, MLS-4, MLS-6, MLS-8, MLS-10	Power from PDA Package or Comes with 110V/ 12VDC Power Supply
ATFR-2000	110 V/ 12VDC Wall Mount Power Supply **(included with purchase of PDA and/or ATF-EA-1.5)**	Plugs in 110V Wall Plug
PG-1/4-150	Pressure Gauges (0-150 PSI); (2) required per strainer	N/A

*1" and 2" valve packages also available: 1" valve part# ATF-EA-1.0; 2" valve part # ATF-EA-2.0

MILLER-LEAMAN
INCORPORATED

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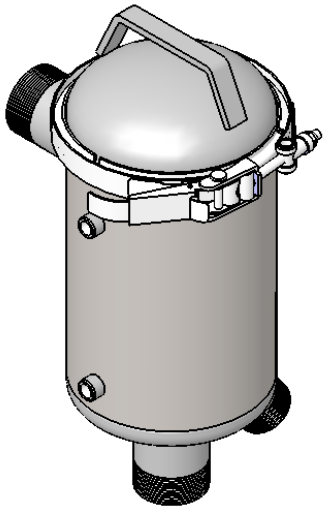
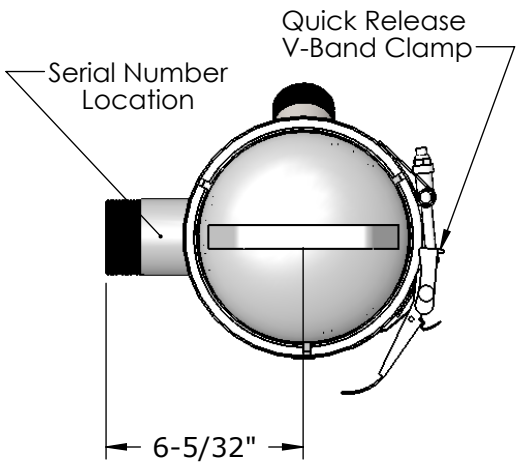
Phone: 386.248.0500 • Fax: 386.248.3033 • Toll Free 800.881.0320
www.millerleaman.com • Email: sales@millerleaman.com

Made in the U.S.A.



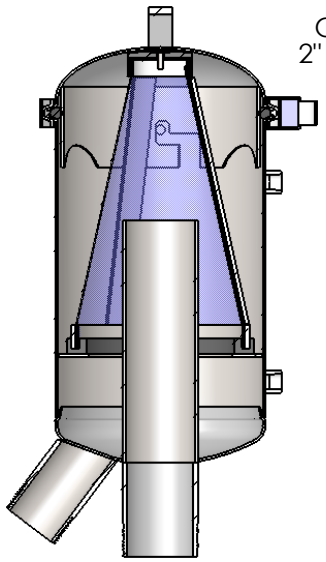


GENERAL SPECIFICATIONS:
- Maximum Flow: 100 GPM (No minimum flow requirement).
- Maximum Pressure: 125 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 122 Sq. In.
- Dry Weight: 14 lbs.
- Wet Weight: 30 lbs / Volume: 1.7 gal.
- Maximum Temperature: **135° F.**
  (Consult Factory for higher temperature applications).

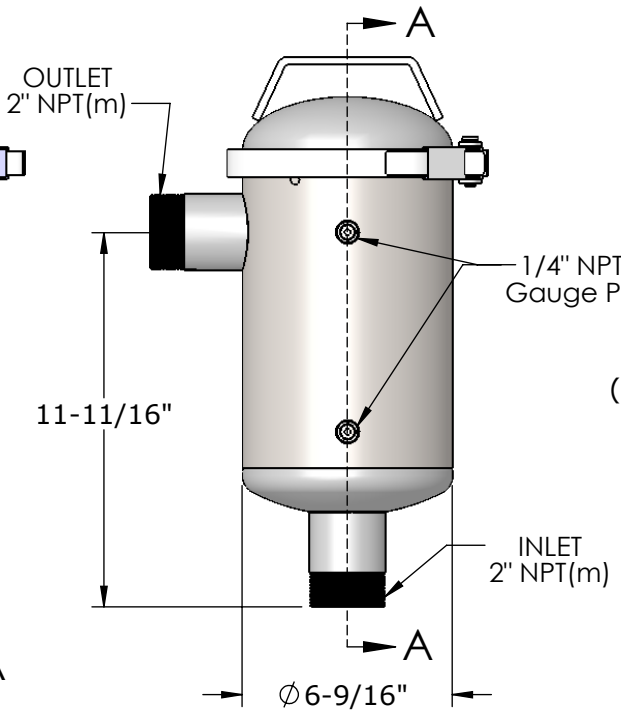
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

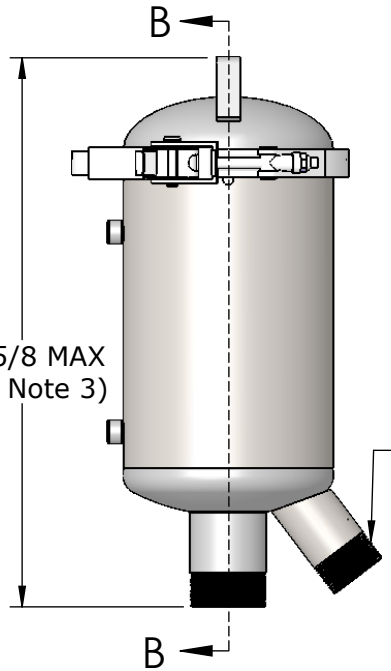
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

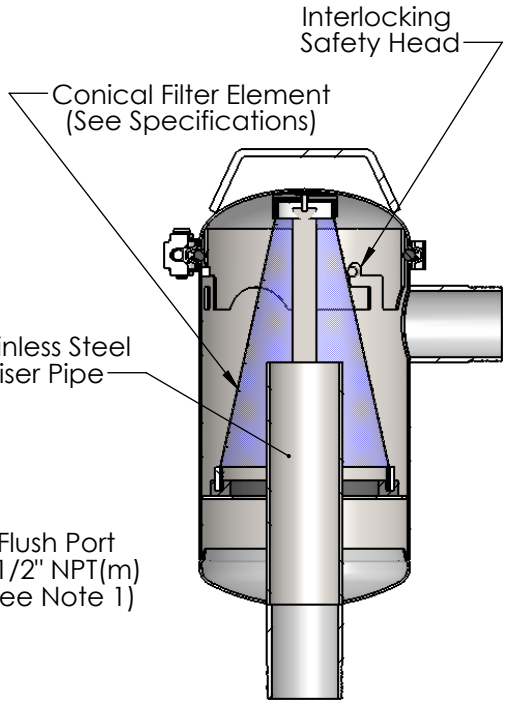
NOTES:
1- Flush Port is available in larger sizes and locations.
2- Dimensions are for informational purposes only and are subject to change.
3- 24" Overall height required for filter element removal.



SECTION A-A

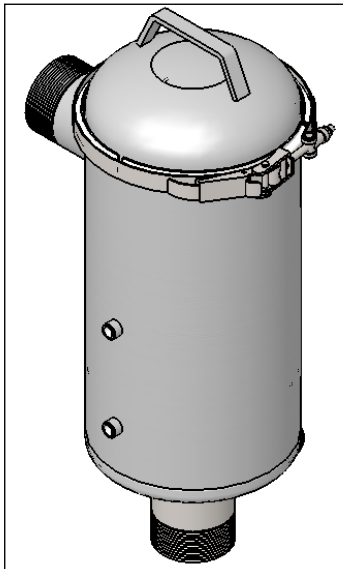


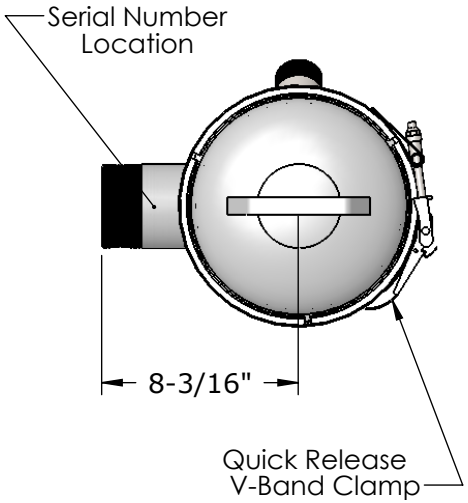




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/30/04	TITLE
	CHECKED			Thompson Strainer MLS-2
MILLER LEAMAN INC	ENG APPR.			
800 Orange Avenue, Daytona Beach, FL 32114	REVISION			
	SHEET 1 of 1	MLI REF# ML20446	REV: D	



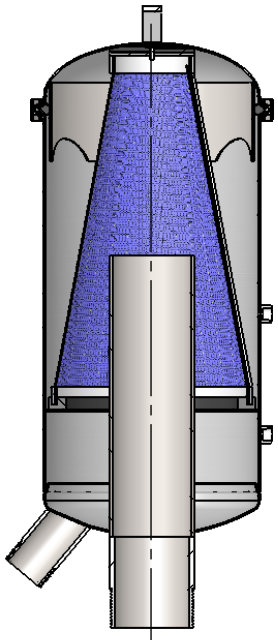


GENERAL SPECIFICATIONS:
- Maximum Flow: 200 GPM (No minimum flow requirement).
- Maximum Pressure: 125 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 200 Sq. In.
- Dry Weight: 30 lbs.
- Wet Weight: 60 lbs / Volume: 3.3 gal.
- Maximum Temperature: **135° F.**
  (Consult Factory for higher temperature applications).

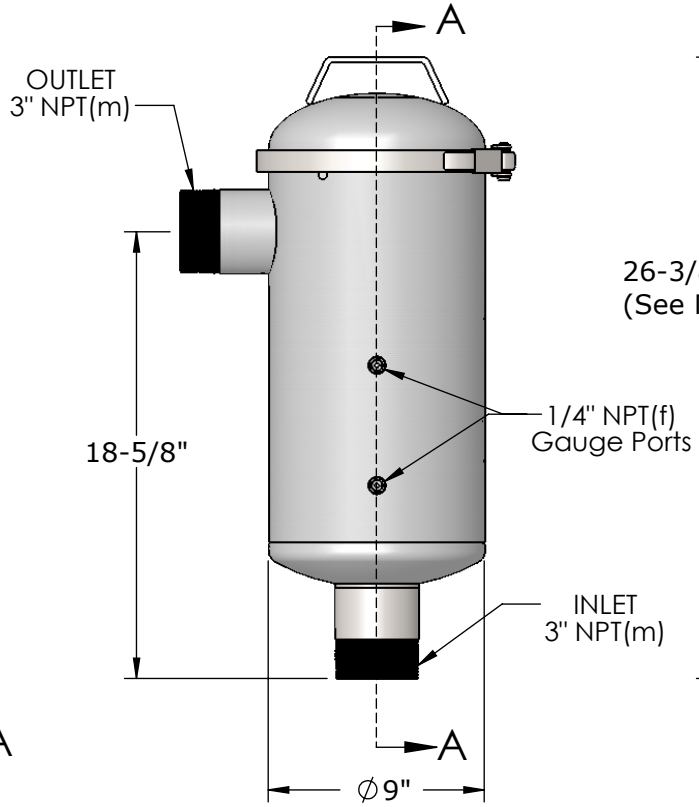
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

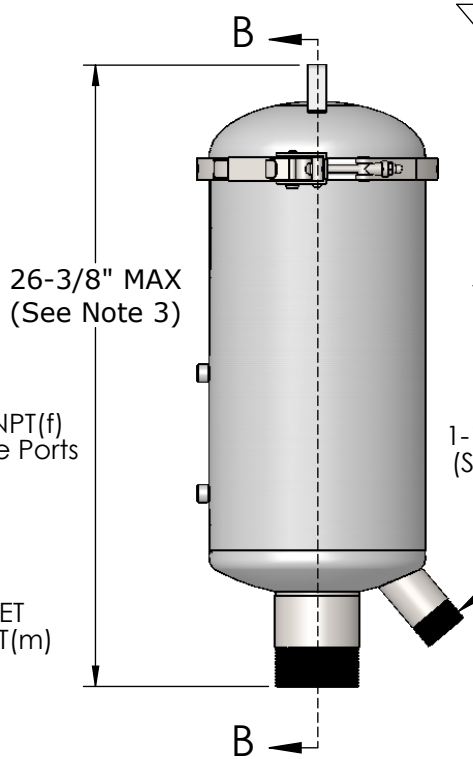
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

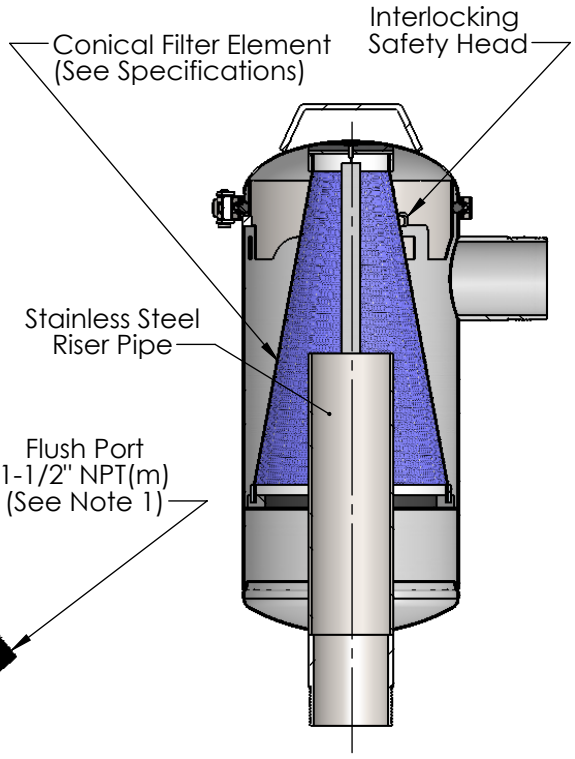
NOTES:
1- Flush Port is available in larger sizes.
2- Dimensions are for informational purposes only and are subject to change.
3- 38" Overall height is required for filter element removal.



SECTION A-A





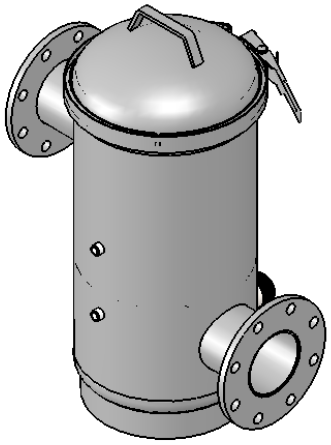


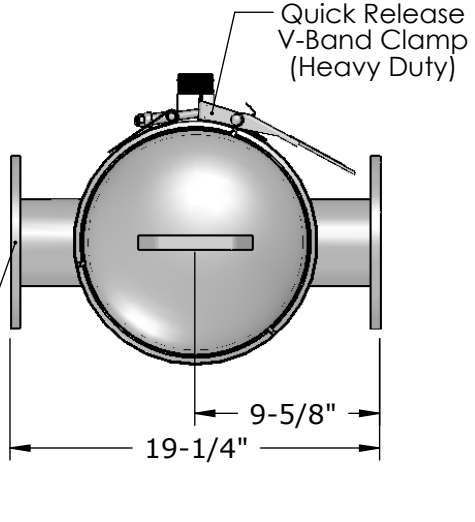
SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	12/2/04
	CHECKED		
MILLER LEAMAN INC	ENG APPR.		
800 Orange Avenue, Daytona Beach, FL 32114	REVISION		
	SHEET 1 of 1	MLI REF#ML20450	REV: D

TITLE

Thompson Strainer MLS-3



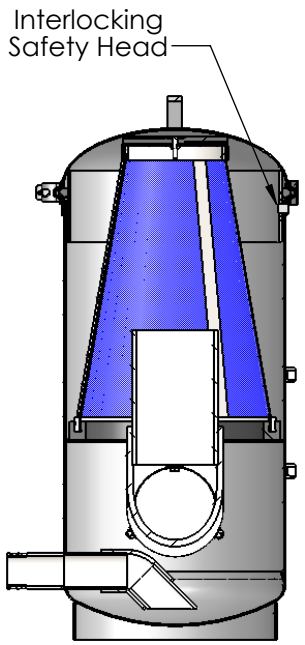


GENERAL SPECIFICATIONS:
- Maximum Flow: 350 GPM (No minimum flow requirement).
- Maximum Pressure: 125 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 367 Sq. In.
- Dry Weight: 60 lbs.
- Wet Weight: 160 lbs / Volume: 11.1 gal.
- Maximum Temperature: **135° F.**
  (Consult Factory for higher temperature applications).

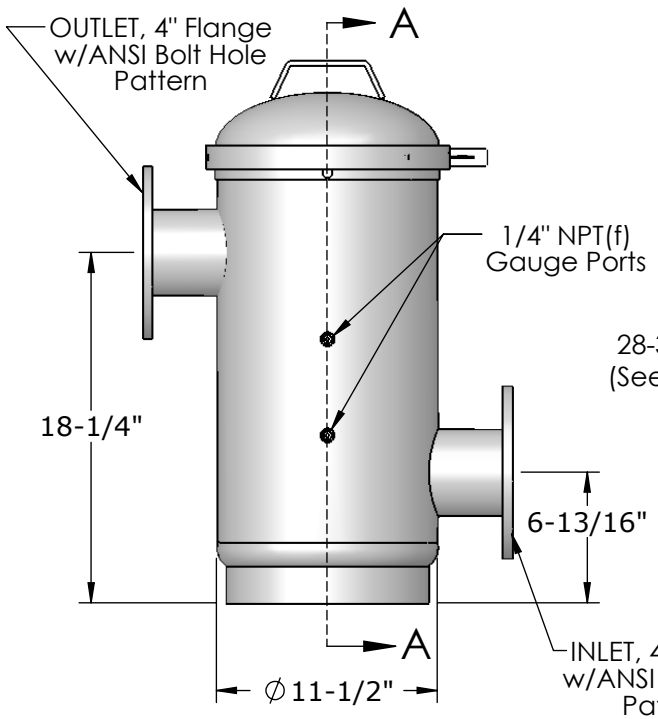
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).
- Clamp: 301, 302 or 304 Stainless.

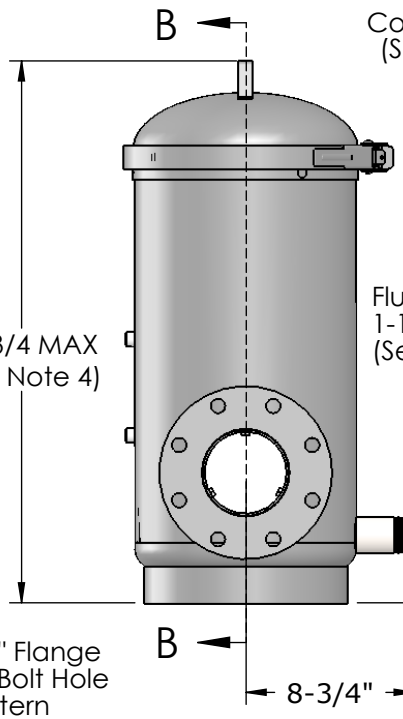
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

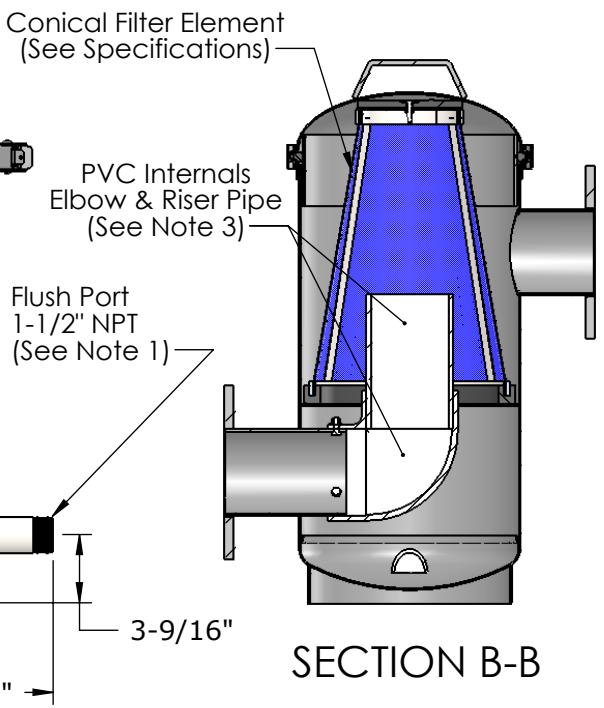
NOTES:
1- Flush Port is available in larger sizes. (Bottom Flush also available).
2- Dimensions are for informational purposes only and are subject to change.
3- Stainless Steel Internals (Elbow & Riser Pipe) are also available.
4- 42" Overall height is required for filter element removal.



SECTION A-A

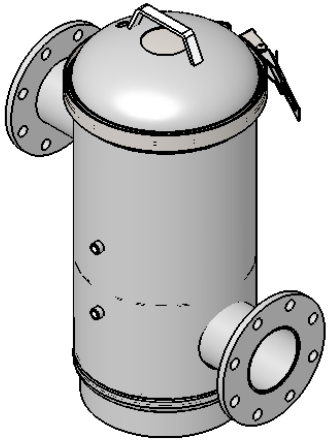


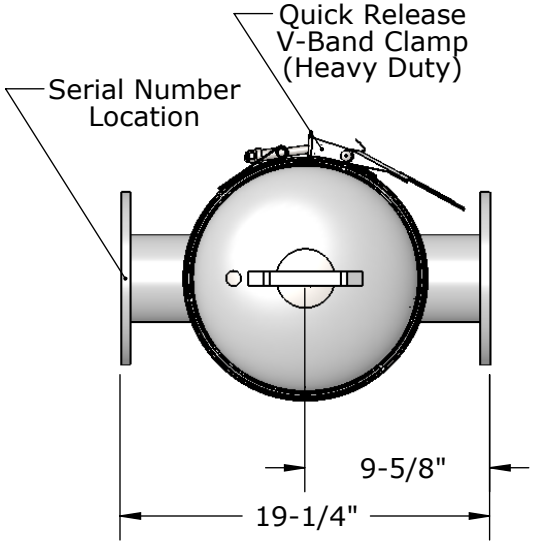




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/5/04	TITLE
	CHECKED			Thompson Strainer MLS-4C
MILLER LEAMAN INC	ENG APPR.			
800 Orange Avenue, Daytona Beach, FL 32114	REVISION			
	SHEET 1 of 1	MLI REF# ML20398	REV: H	



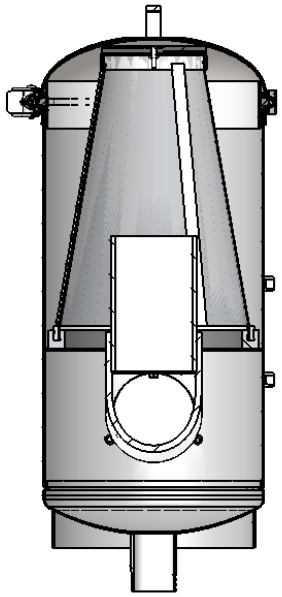


GENERAL SPECIFICATIONS:
- Maximum Flow: 350 GPM (No minimum flow requirement)
- Maximum Pressure: 125 PSI (Higher pressure models are available).
- Maximum Temperature: 135° F (Higher temperature models are available).
- Screen Surface Area 367 Sq. In.

MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)
- Clamp: 301,302, or 304 Stainless

SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

NOTES:
1- Flush Port is available in larger sizes.
2- Stainless Steel Internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 42" overall height is required for filter element removal.



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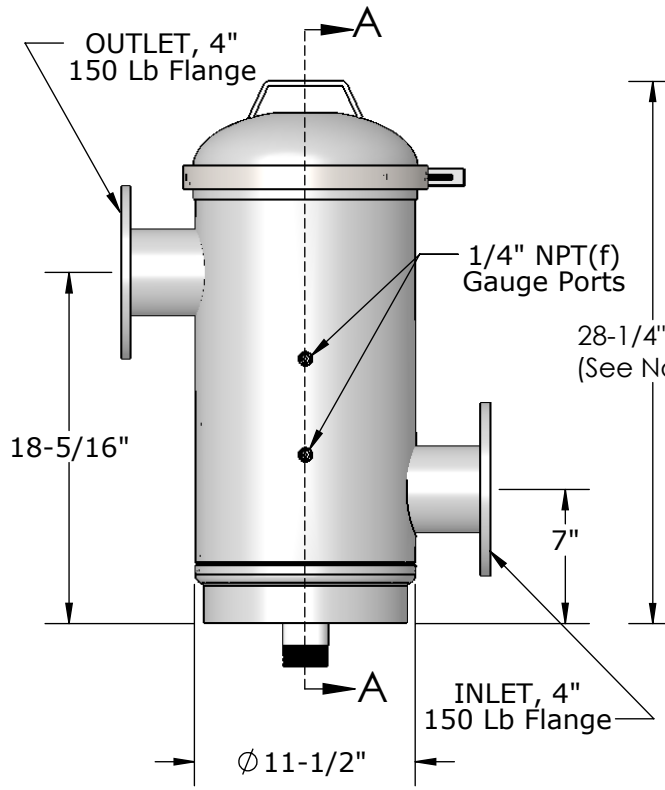
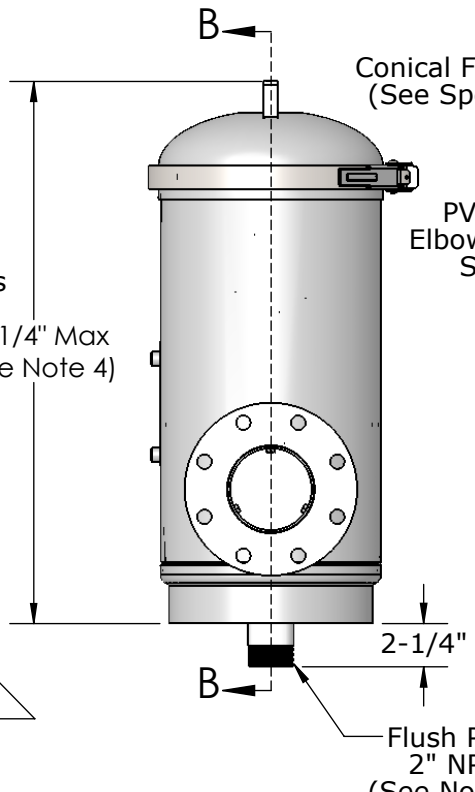
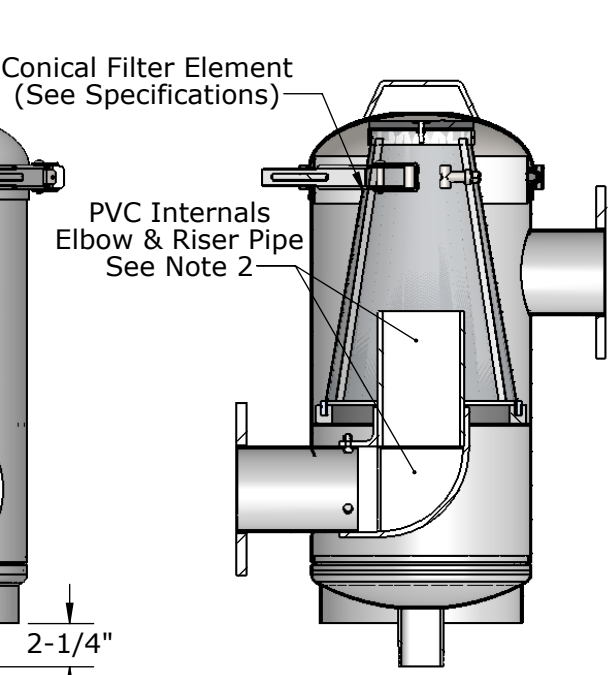
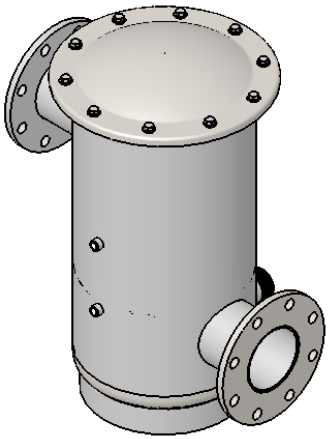


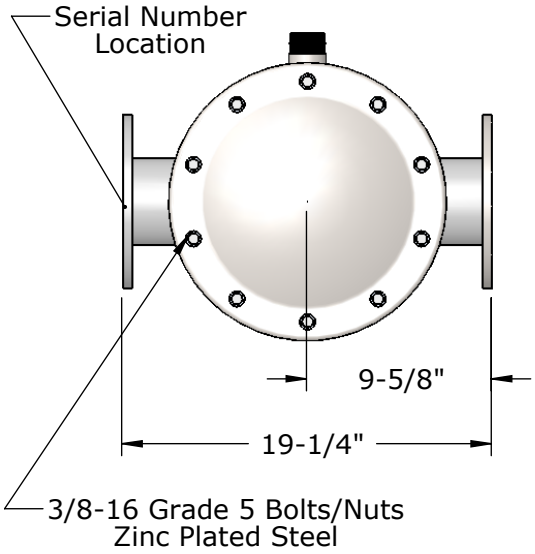




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	5/17/10	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-4C-MOD13
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



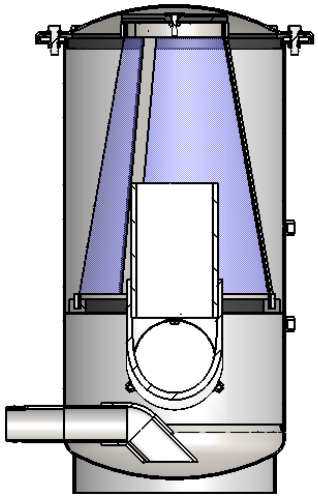


GENERAL SPECIFICATIONS:
- Maximum Flow: 350 GPM (No minimum flow requirement).
- Maximum Pressure: 150 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 367 Sq. In.
- Dry Weight: 60 lbs.
- Wet Weight: 160 lbs / Volume: 11.1 gal.
- Maximum Temperature: **135° F.**
  (Consult Factory for higher temperature applications).

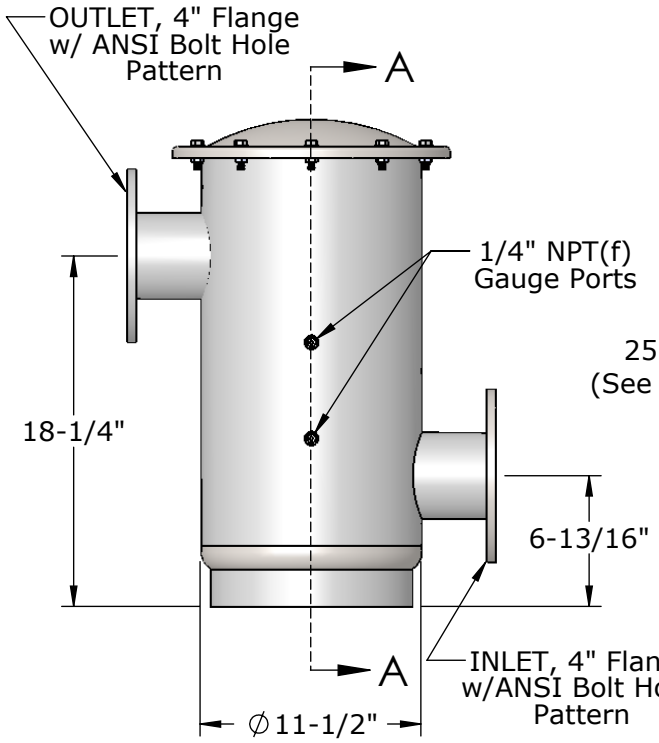
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

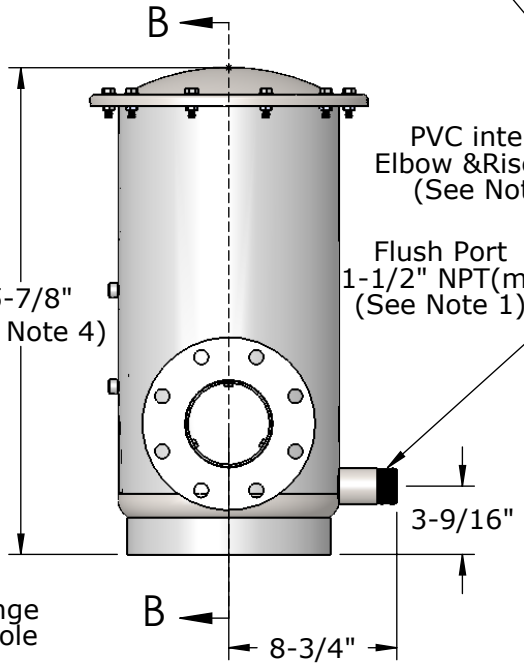
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

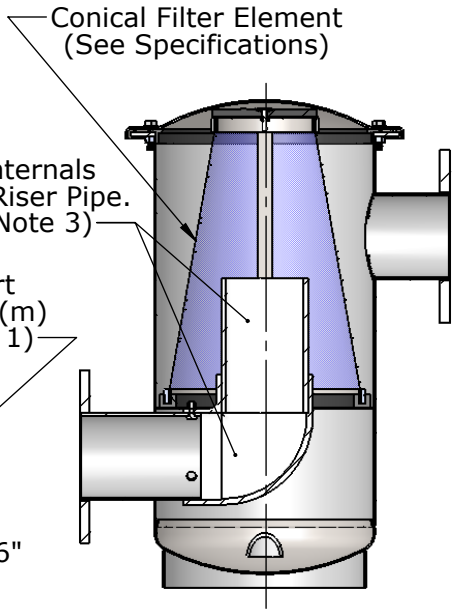
NOTES:
1- Flush Port is available in larger sizes.(Bottom Flush also available).
2- Dimensions are for informational purposes only and are subject to change.
3- Stainless Steel Internals (Elbow & Riser Pipe) are also available.
4- 42" Overall height is required for filter element removal.



SECTION A-A



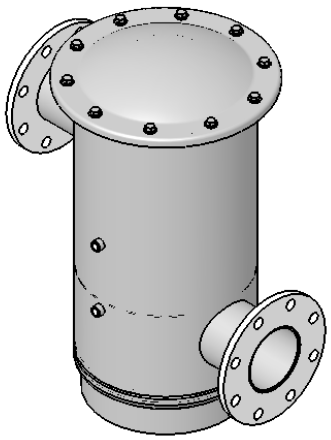


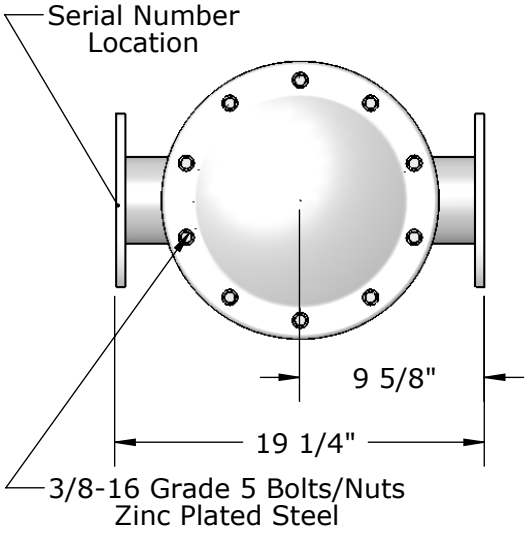


SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/3/04
	CHECKED		
MILLER LEAMAN INC	ENG APPR.		
800 Orange Avenue, Daytona Beach, FL 32114	REVISION		
	SHEET 1 of 1	MLI REF# ML20252	REV: F

TITLE: Thompson Strainer MLS-4B



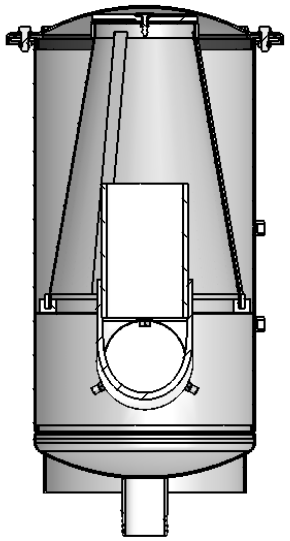


GENERAL SPECIFICATIONS:
- Maximum Flow: 350 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI (Higher pressure models are available. (Not designed for suction/vacuum)
- Maximum Temperature: 135˚F (190˚F with optional Stainless Steel internals) Consult factory for higher temperature applications.
- Screen Surface Area 367 Sq. In.

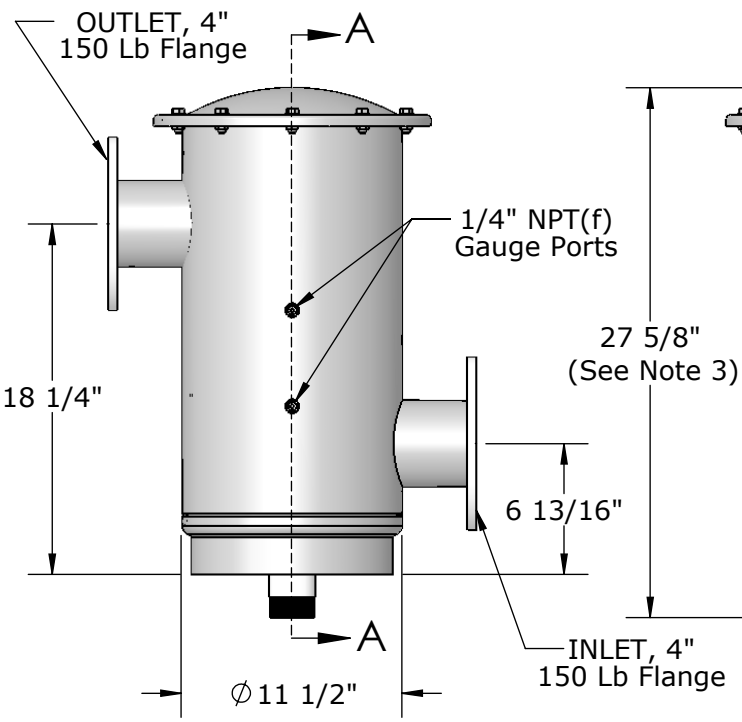
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

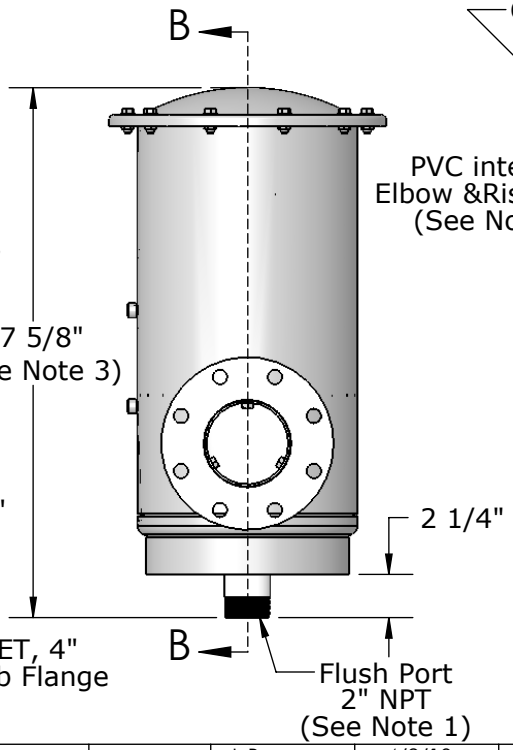
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

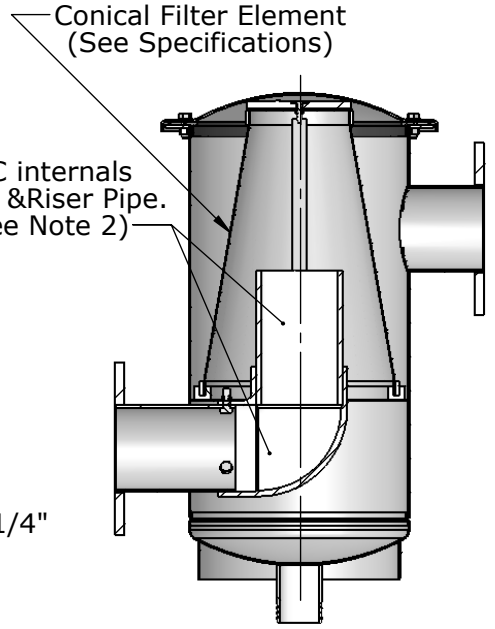
NOTES:
1- Flush Port is available in other sizes and locations.
2- Stainless Steel internals (Elbows and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 44" overall height is required for filter element removal.



SECTION A-A

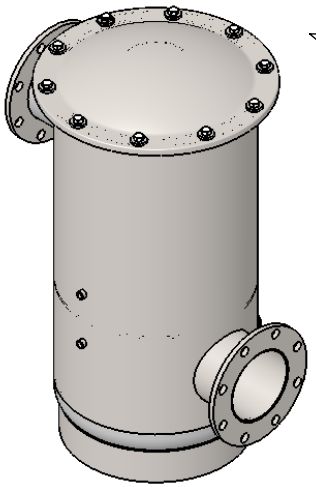


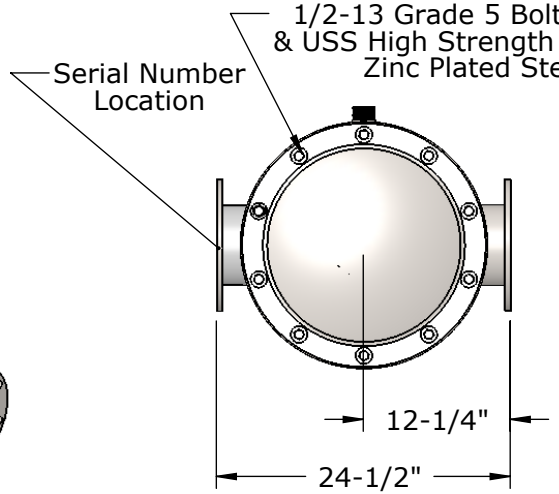




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	4/2/10	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-4B-MOD6
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



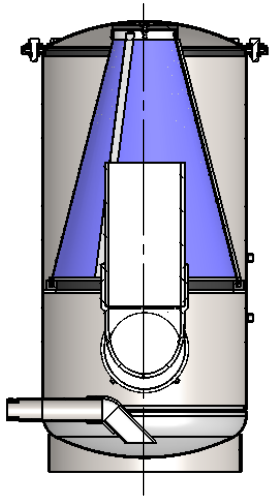


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement).
- Maximum Pressure: 150 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 745 Sq. In.
- Dry Weight: 125 lbs.
- Wet Weight: 425 lbs / Volume: 34.3 gal.
- Maximum Temperature: **135˚ F.**
  (Consult Factory for higher temperature applications).

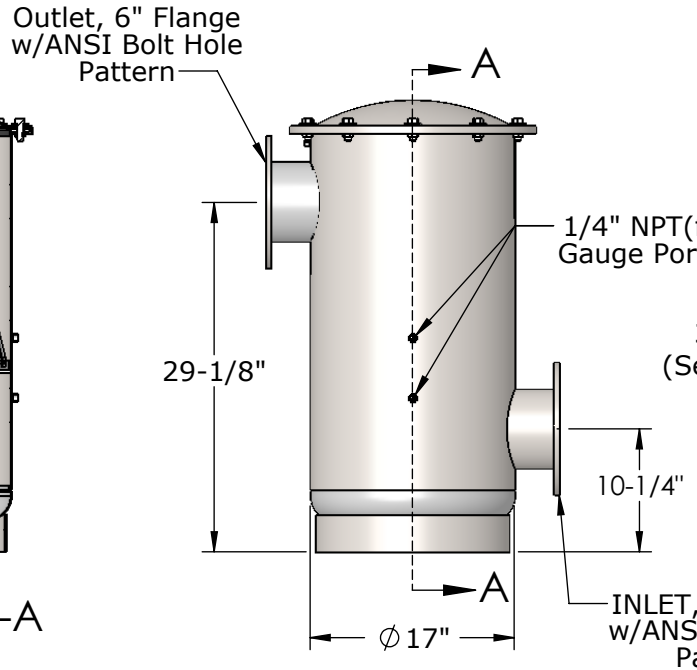
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

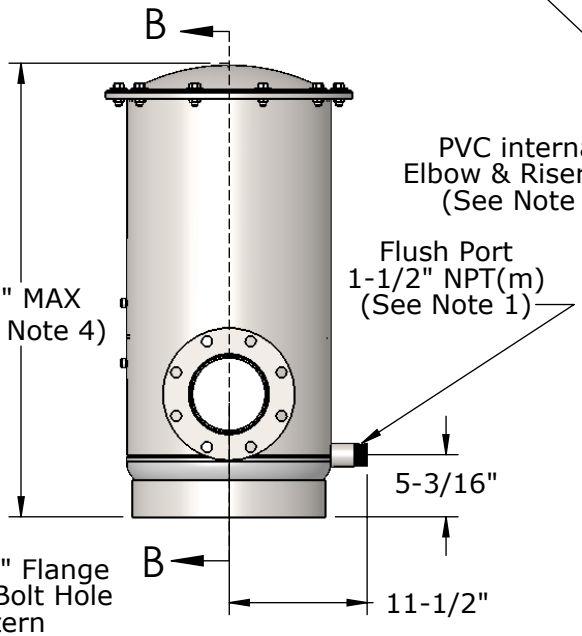
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

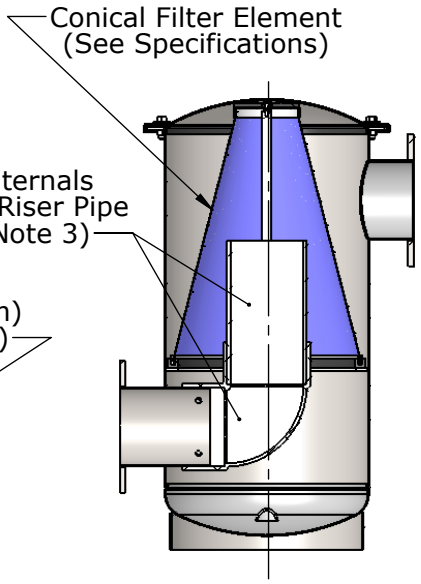
NOTES:
1- Flush Port is available in larger sizes. (Bottom Flush also available).
2- Dimensions are for informational purposes only and are subject to change.
3- Stainless Steel Internals (Elbow & Riser Pipe) are also available.
4- 59" Overall height is required for filter element removal.



SECTION A-A

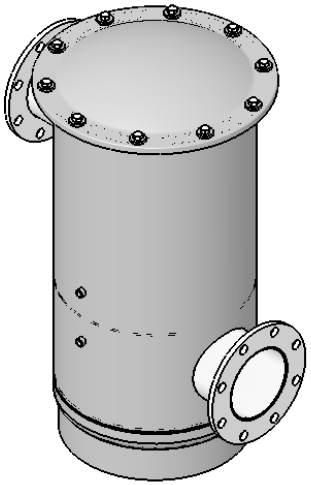


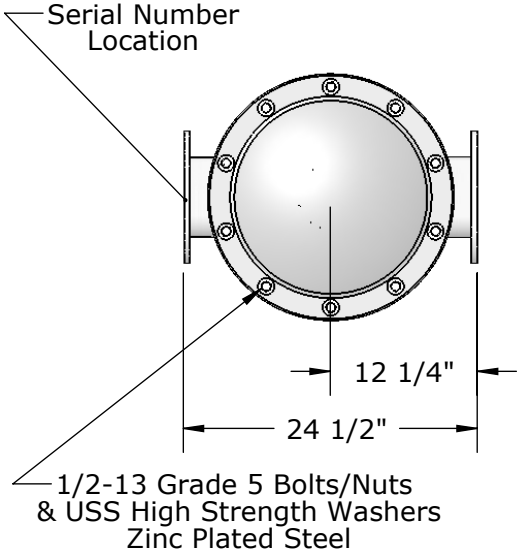




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/15/04	TITLE
	CHECKED			Thompson Strainer
MILLER LEAMAN INC	ENG APPR.			MLS-6
800 Orange Avenue, Daytona Beach, FL 32114	REVISION			
	Sheet 1 of 1	Ref: ML20430	Rev. A	



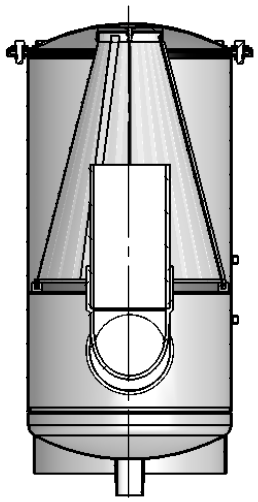


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI (Higher Pressure Models are available)
- Maximum Temperature: 135° F (190° with optional Stainless Steel Internals) Consult factory for higher temperature applications
- Screen Surface Area 745 Sq. In.

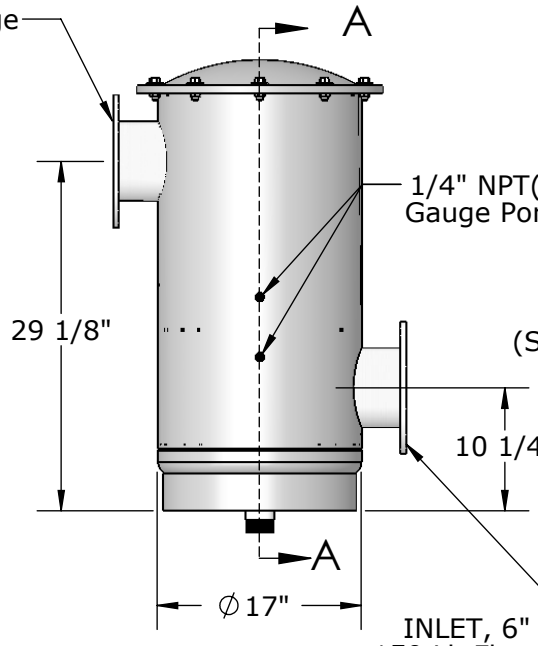
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

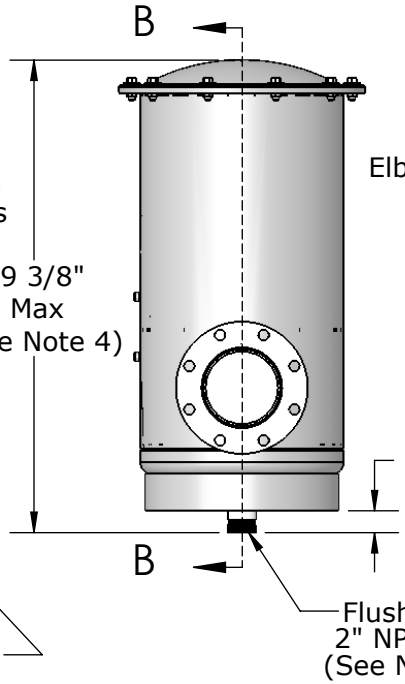
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

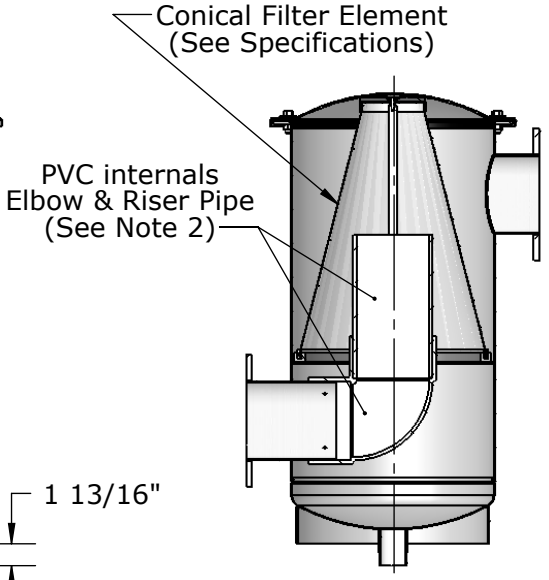
NOTES:
1- Flush Port is available in larger sizes. Bottom Flush Port is also available.
2- Stainless Steel internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 60" overall height is required for filter element removal.



SECTION A-A

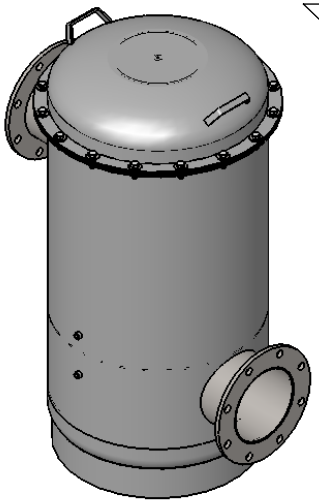


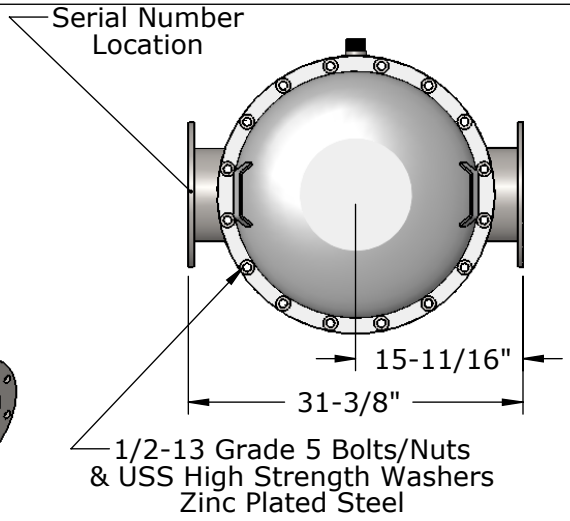




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	4/2/10	TITLE
	CHECKED			Thompson Filter
MILLER-LEAMAN INC.	ENG APPR.			MLS-6-MOD24
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



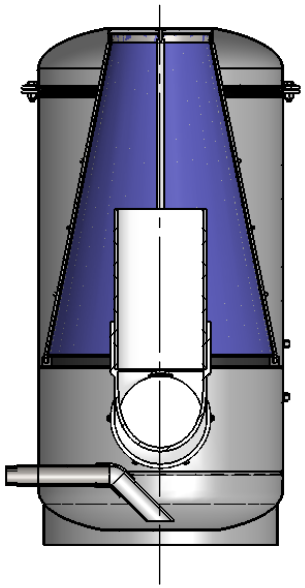


GENERAL SPECIFICATIONS:
- Maximum Flow: 1300 GPM (No minimum flow requirement).
- Maximum Pressure: 150 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 1559 Sq. In.
- Dry Weight: 200 lbs.
- Wet Weight: 955 lbs / Volume: 88.1 gal.
- Maximum Temperature: **135° F.**
  (Consult Factory for higher temperature applications).

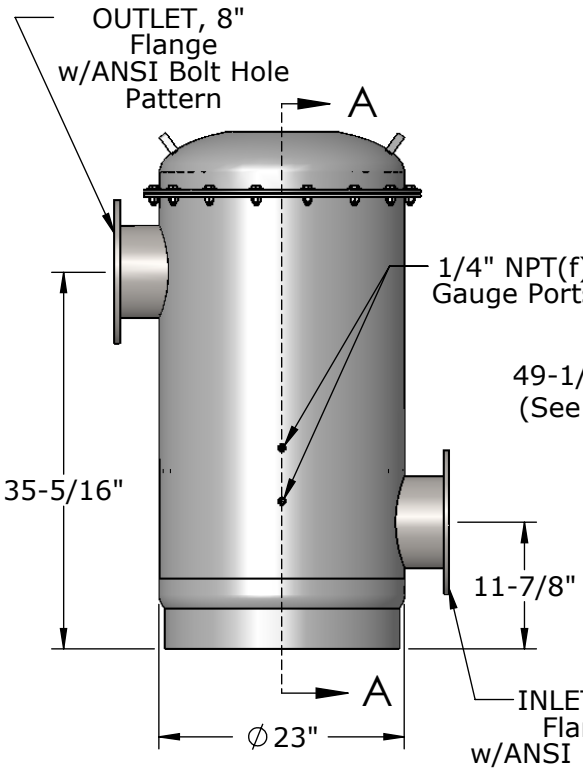
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

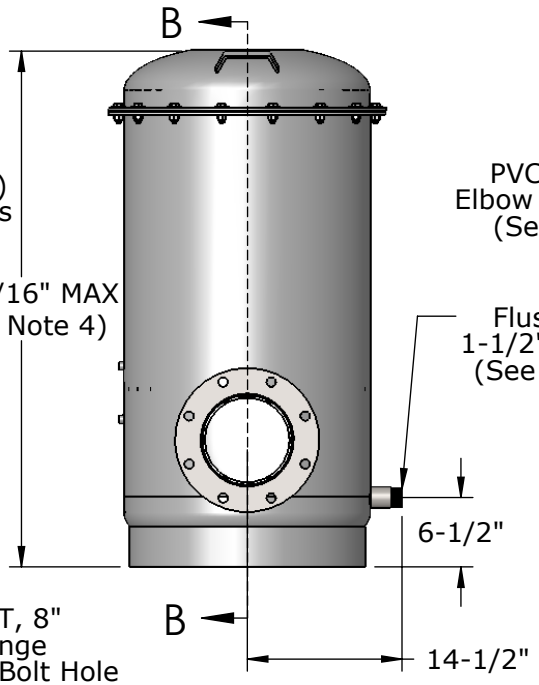
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

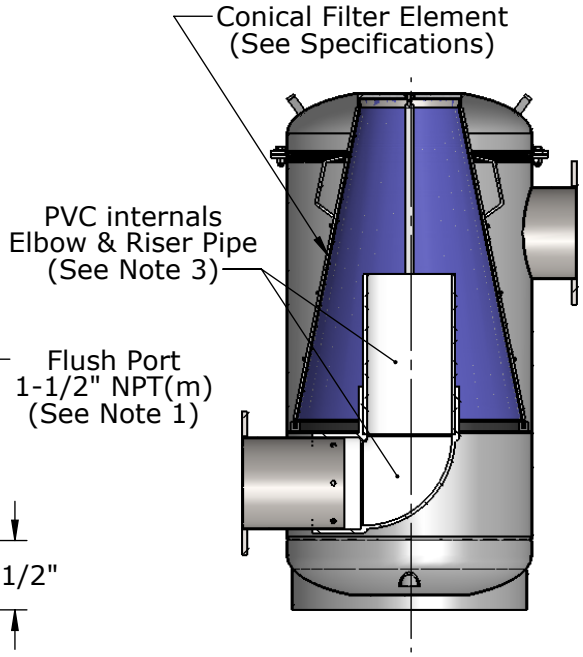
NOTES:
1- Flush Port is available in larger sizes. (Bottom Flush also available).
2- Dimensions are for informational purposes only and are subject to change.
3- Stainless Steel Internals (Elbow & Riser Pipe) are also available.
4- 76" Overall height is required for filter element removal.



SECTION A-A

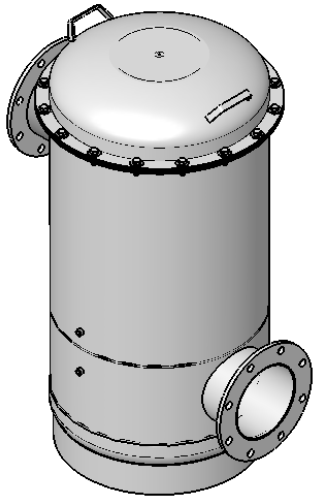


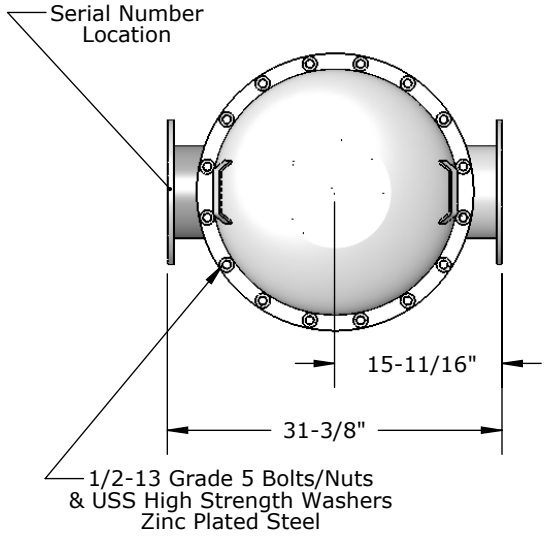




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/10/04	TITLE
	CHECKED			Thompson Strainer MLS-8
MILLER LEAMAN INC	ENG APPR.			
800 Orange Avenue, Daytona Beach, FL 32114	REVISION			
	Sheet 1 of 1	MLI Ref# ML20424	REV: B	



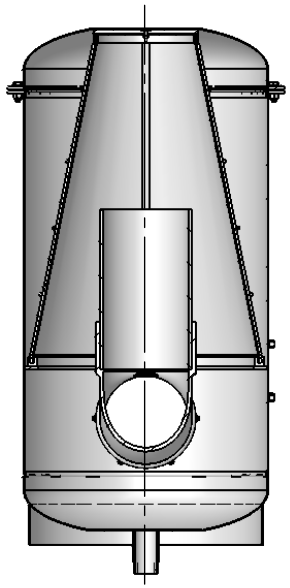


GENERAL SPECIFICATIONS:
- Maximum Flow: 1300 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI
- Maximum Temperature: 135˚ F
- Screen Surface Area 1559 Sq. In.

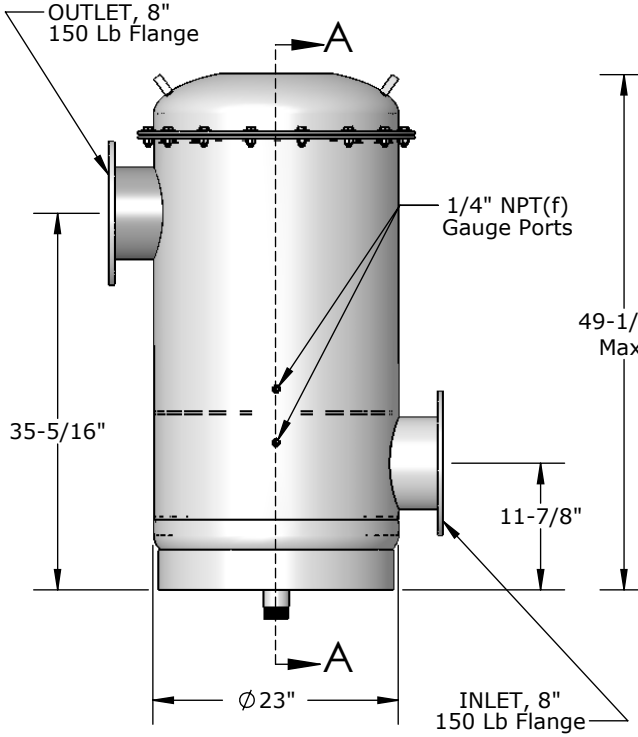
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

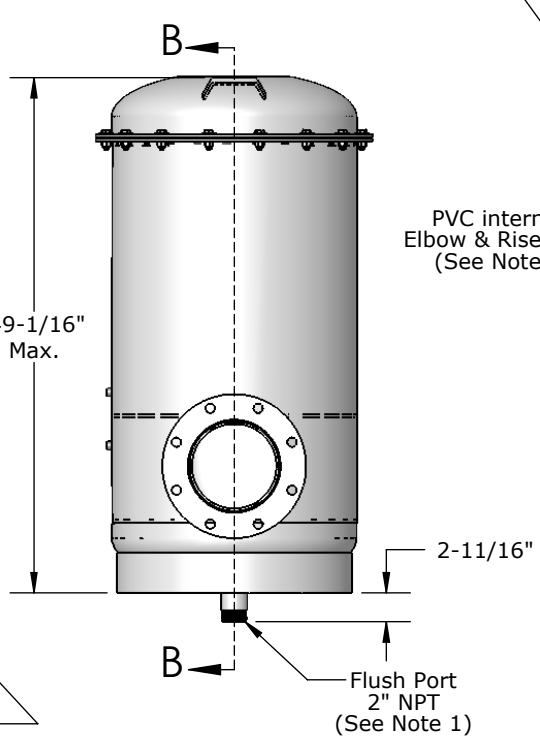
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

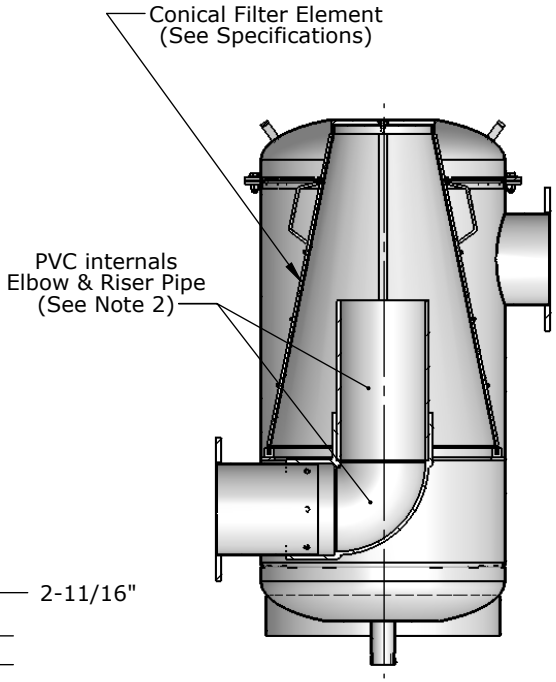
NOTES:
1- Flush Port is available in larger sizes.
2- Stainless Steel internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 76" Overall height requirement for filter element removal.



SECTION A-A

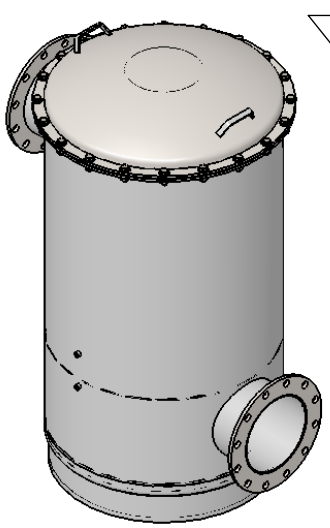


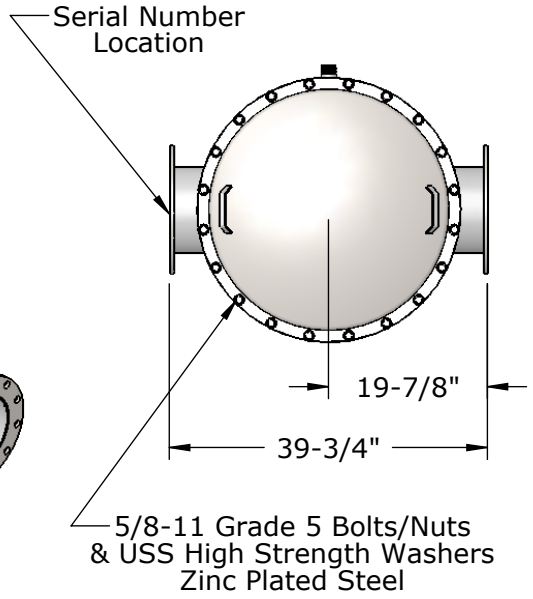




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	5/5/10	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-8-MOD7
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



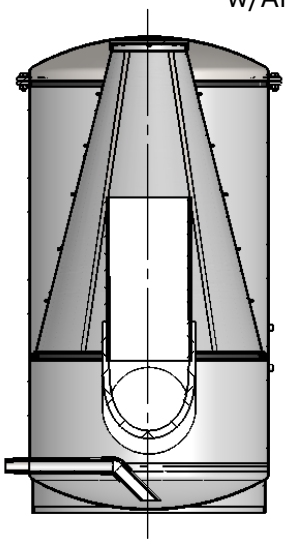


GENERAL SPECIFICATIONS:
- Maximum Flow: 2000 GPM (No minimum flow requirement).
- Maximum Pressure: 150 PSI (Higher pressure models available).
- Not Designed for Suction / Vacuum.
- Screen Surface Area 2434 Sq. In.
- Dry Weight: 400 lbs.
- Wet Weight: 1940 lbs / Volume: 180.6 gal.
- Maximum Temperature: **135˚ F.**
  (Consult Factory for higher temperature applications).

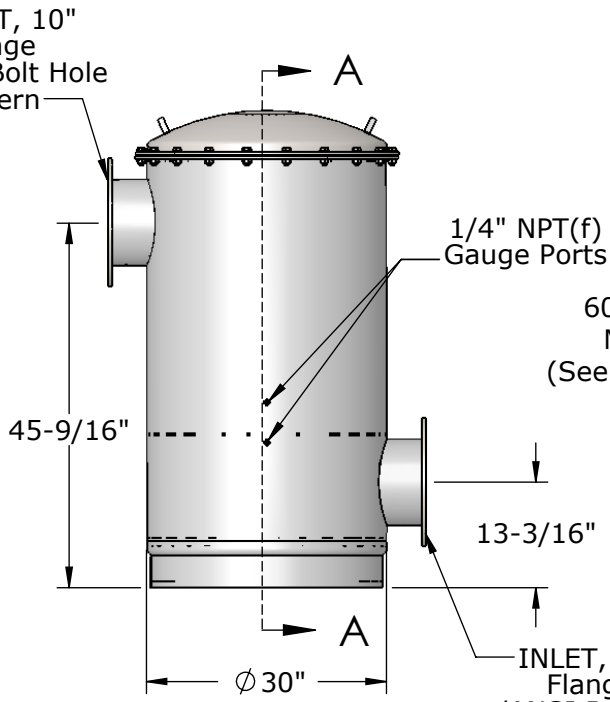
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional).
- Gasket: EPDM standard (other compounds available).
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup).

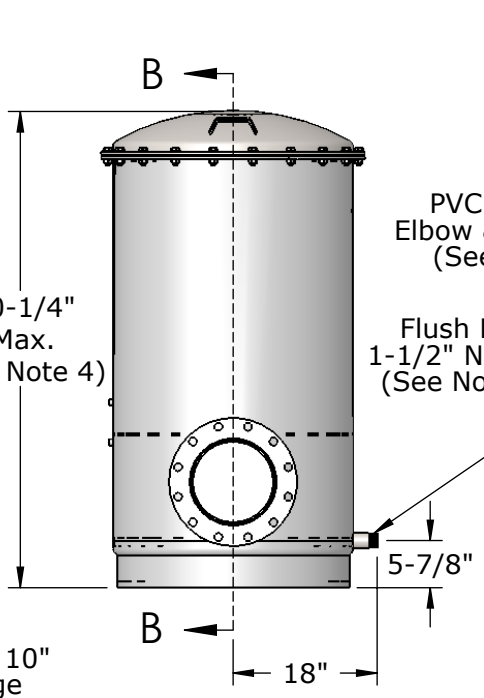
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available.
  (See product catalog for samples).

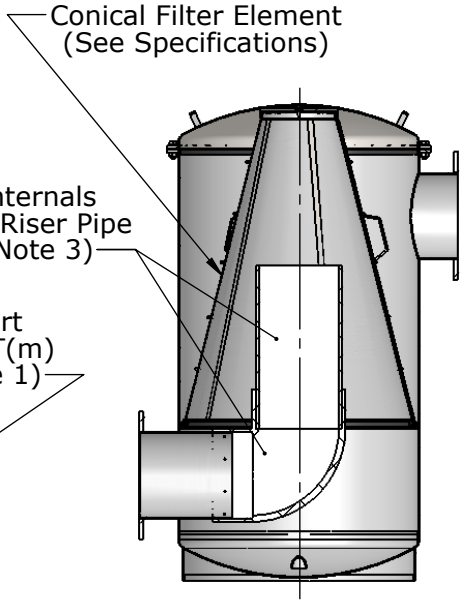
NOTES:
1- Flush Port is available in larger sizes. (Bottom Flush also available).
2- Dimensions are for informational purposes only and are subject to change.
3- Stainless Steel Internals (Elbow & Riser Pipe) are also available.
4- 96" Overall height is required for filter element removal.



SECTION A-A

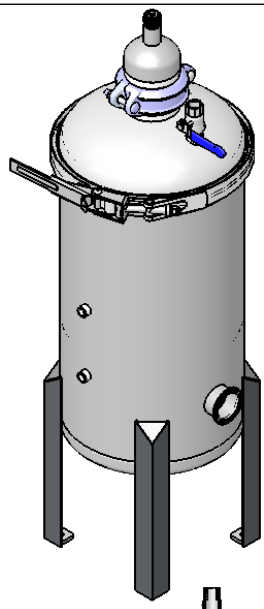


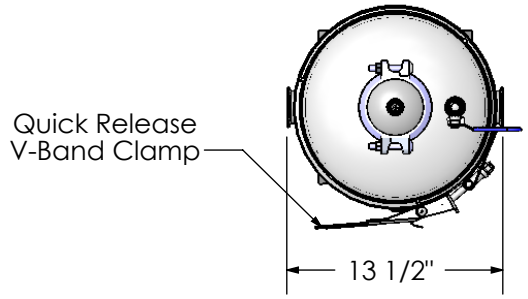




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	11/16/04	TITLE
	CHECKED			Thompson Strainer MLS-10
MILLER LEAMAN INC	ENG APPR.			
800 Orange Avenue, Daytona Beach, FL 32114	REVISION			
	Sheet 1 of 1	MLI Ref# ML20438	REV: B	

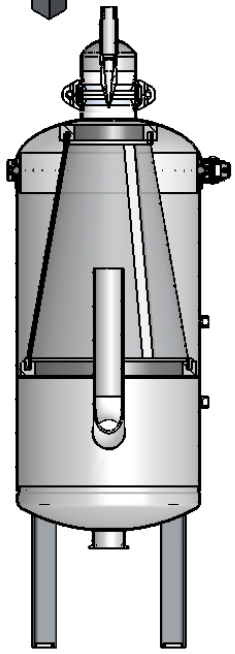




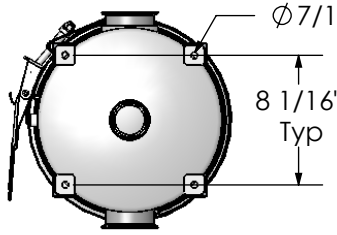
GENERAL SPECIFICATIONS:
- Maximum Flow: 50 GPM (No minimum flow requirement)
- Maximum Pressure: 125 PSI
- Maximum Temperature: 135° F
- Screen Surface Area 367 Sq. In.

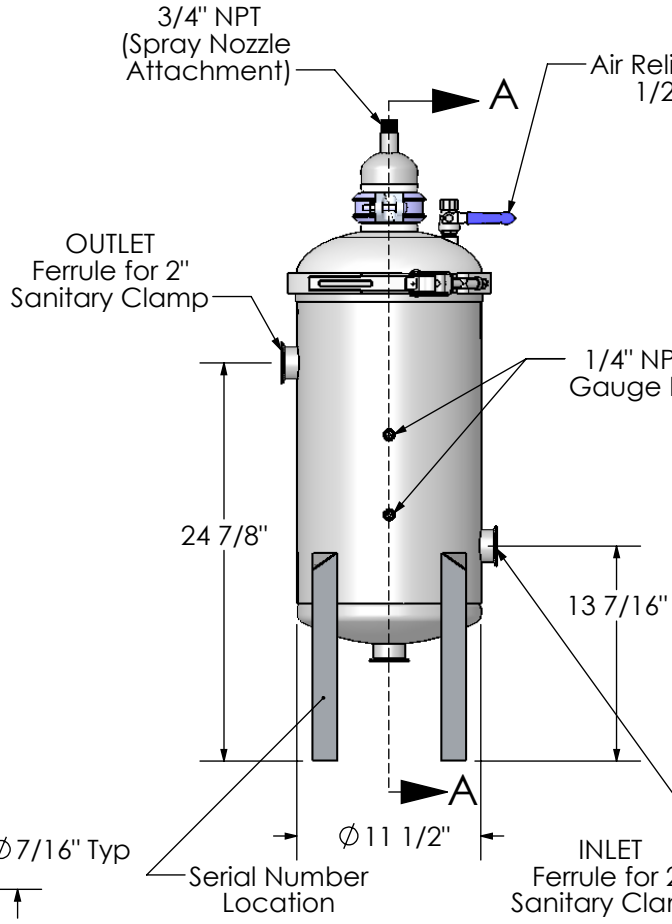
MATERIALS:
- Housing: 304 Stainless Steel
- Gasket: EPDM standard (other compounds available)
- Screen: 60 Mesh-316 Stainless, 1/4" perforated sheet backup-316 Stainless

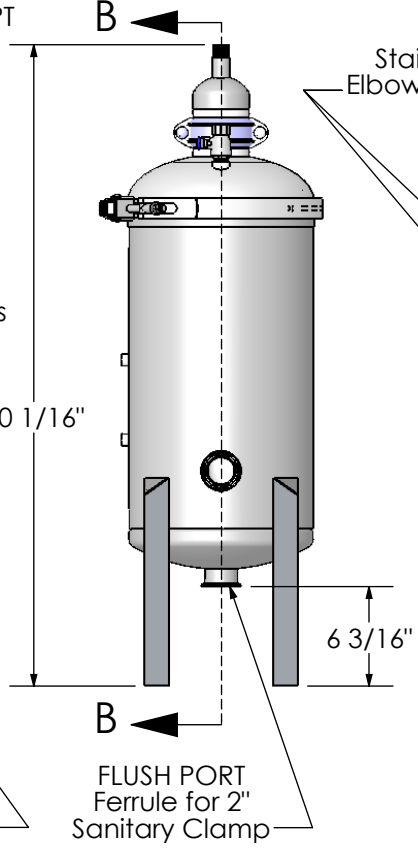
NOTES:
1- Dimensions are for informational purposes only and are subject to change.
2- 52" Overall height required for filter element removal.

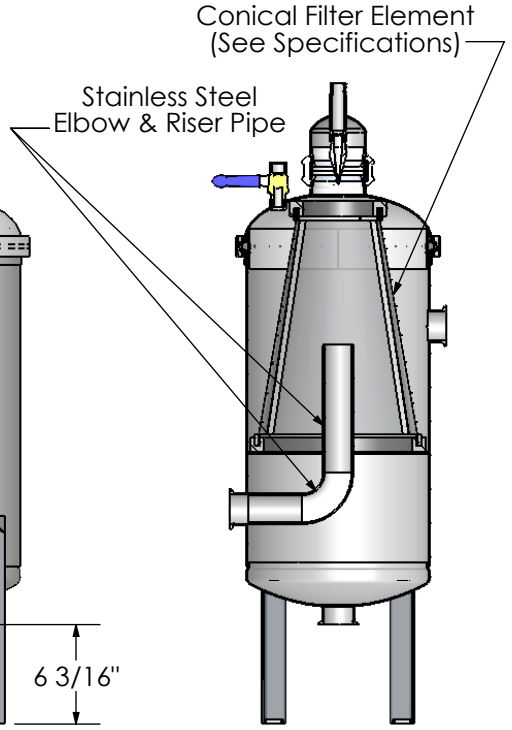


SECTION A-A





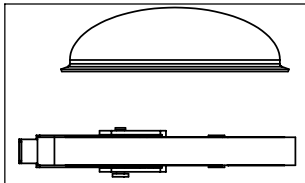


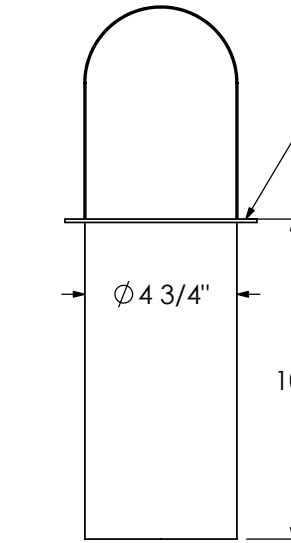


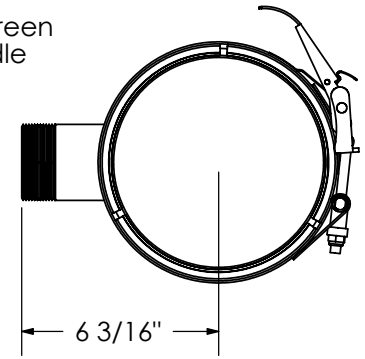
SECTION B-B

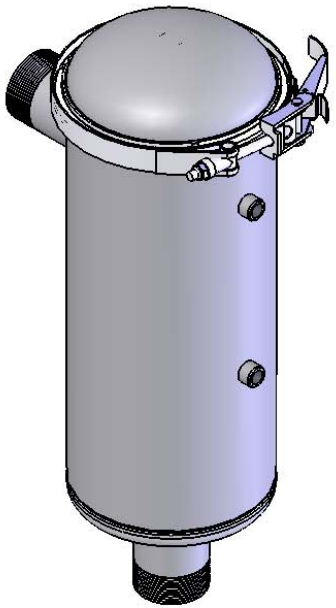
PRODUCT SPECIFICATION	DRAWN	J. Larsen	4/15/08	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-4C-MOD20
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1		REVISION A	

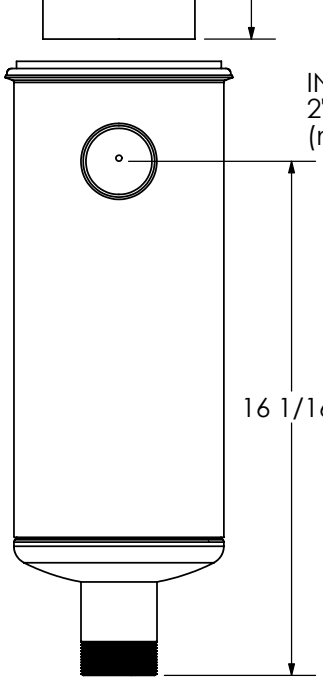
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

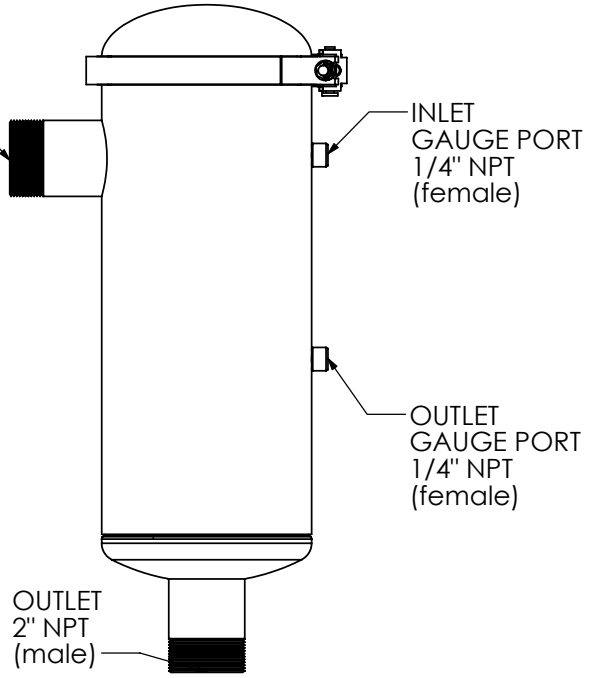


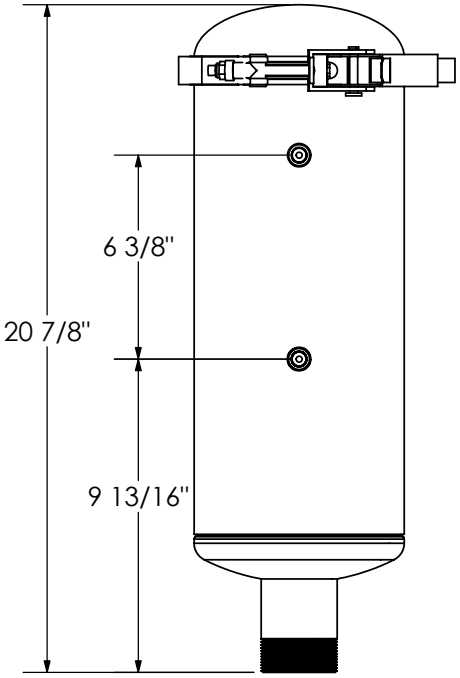


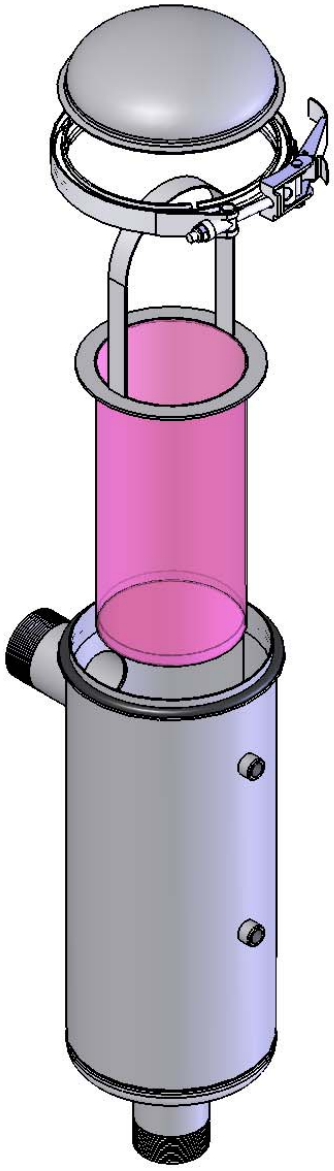












PRODUCT SPECIFICATION

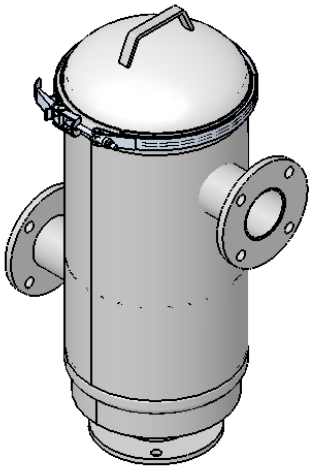
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

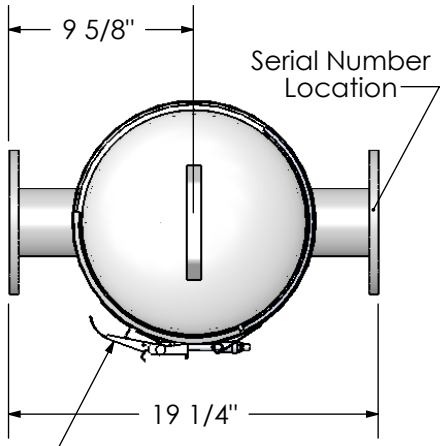
DRAWN	S. Richards	6/12/06
CHECKED		
ENG APPR.		
MKT APPR.		

SHEET 1 OF 1

TITLE

Basket Strainer 2" Housing with 2" NPT Connections



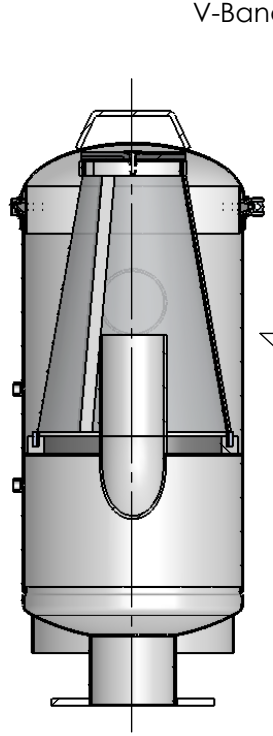


GENERAL SPECIFICATIONS:
- Maximum Flow: 350 GPM (No minimum flow requirement)
- Maximum Pressure: 125 PSI (Higher pressure models are available).
- Maximum Temperature: 135° F (Higher temperature models are available).
- Screen Surface Area 367 Sq. In.

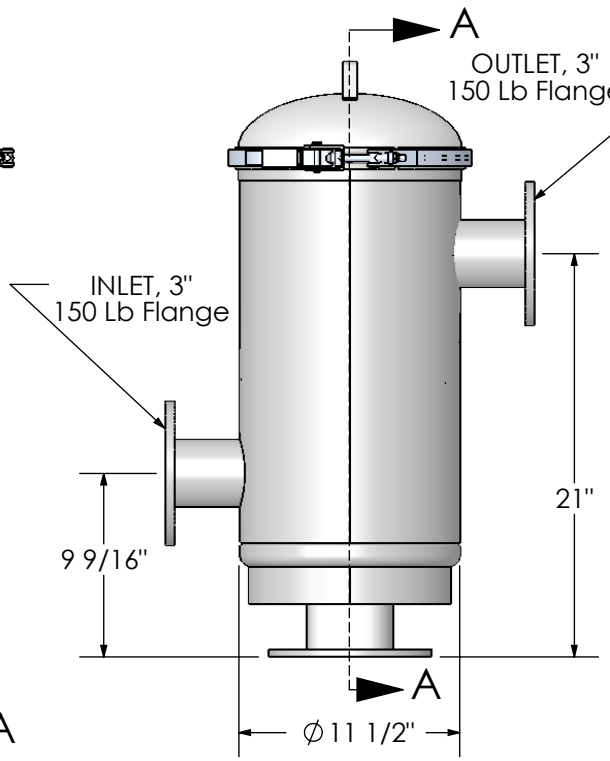
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen: 1/4" perforated sheet
- Clamp: 301,302, or 304 Stainless

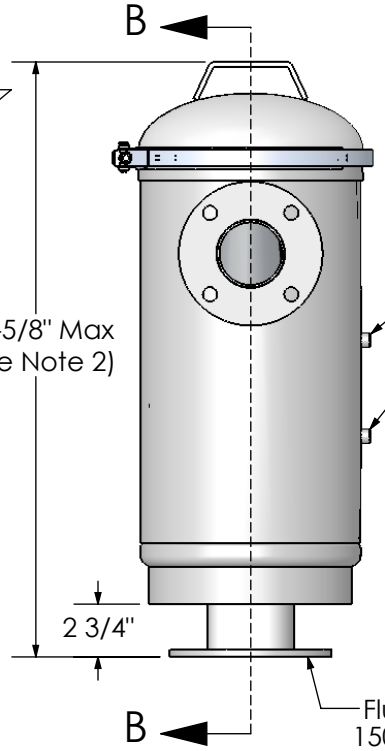
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

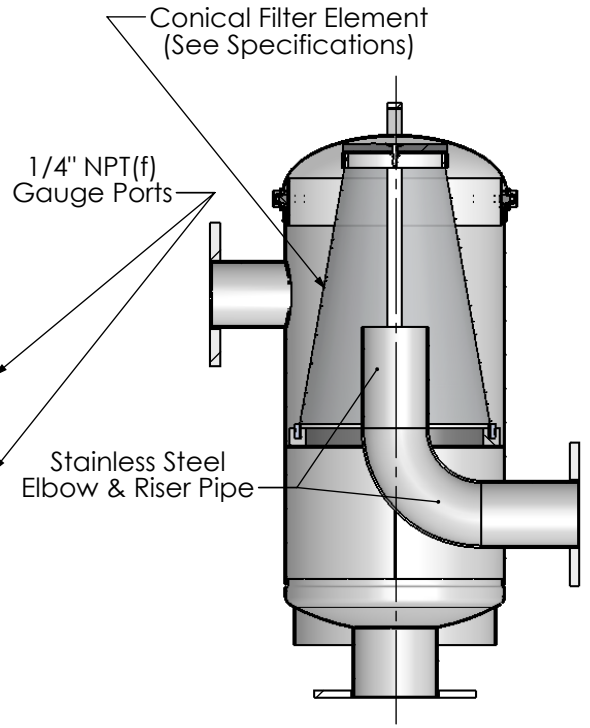
NOTES:
1- Dimensions are for informational purposes only and are subject to change.
2- 45" overall height is required for filter element removal.



SECTION A-A

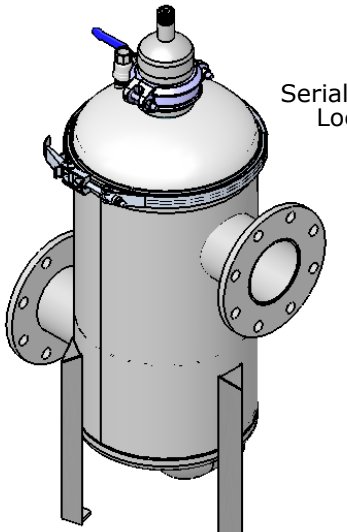


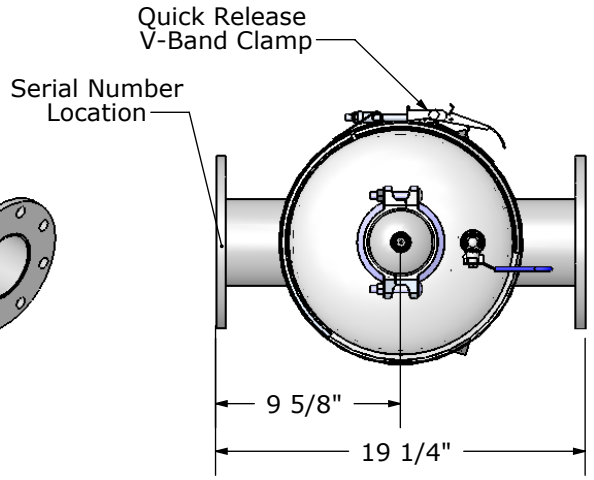




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	J. Larsen	10/24/07	TITLE: Thompson Strainer MLS-4C-MOD16
	CHECKED			
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



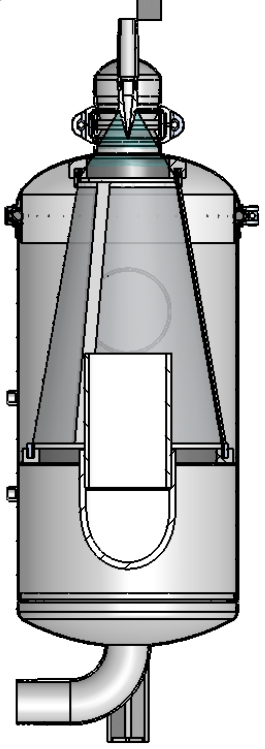


GENERAL SPECIFICATIONS:
- Maximum Flow: 200 GPM (No minimum flow requirement)
- Maximum Pressure: 125 PSI
- Maximum Temperature: 135° F
- Screen Surface Area 367 Sq. In.

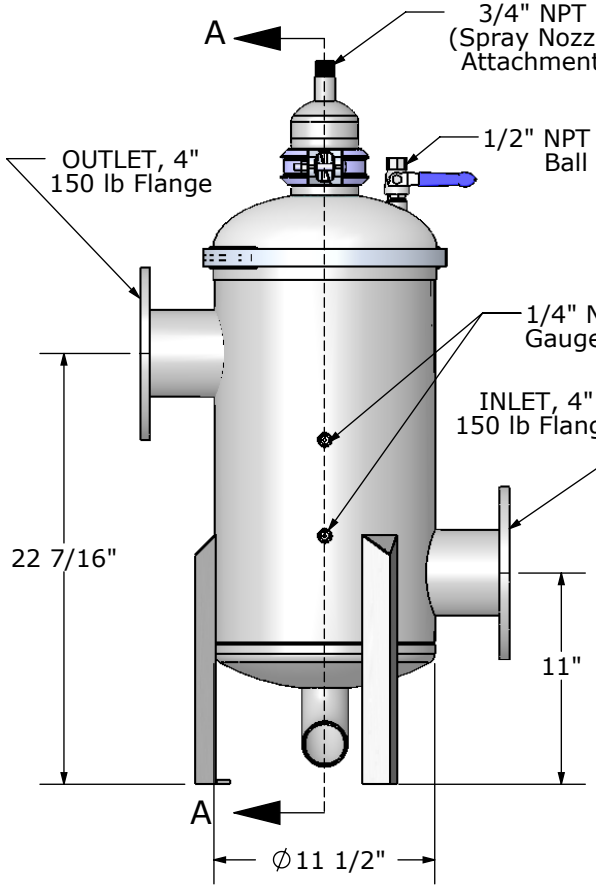
MATERIALS:
- Housing: 304 Stainless Steel
- Gasket: EPDM standard (other compounds available)
- Screen: 100 Mesh-304 Stainless.

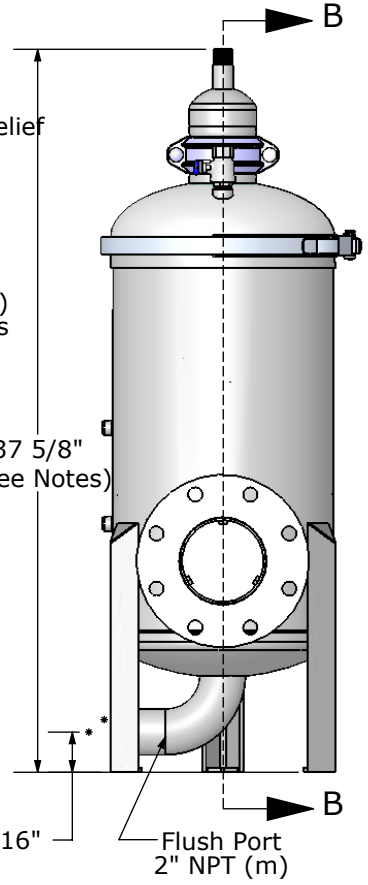
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

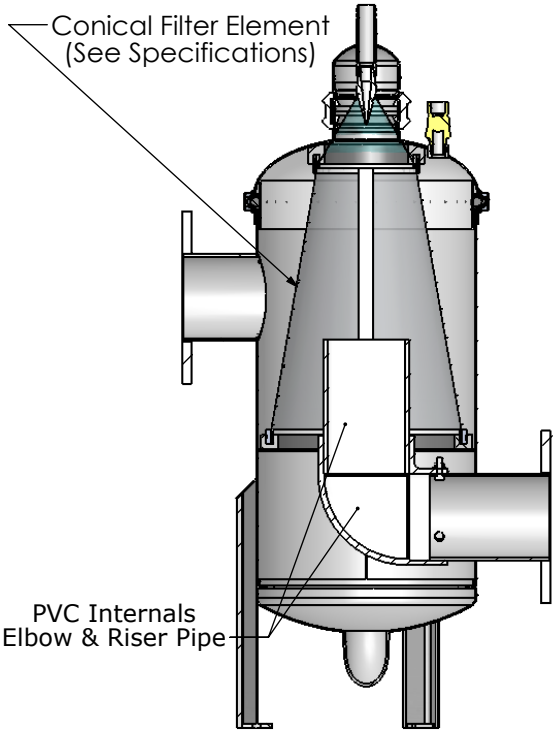
NOTES:
1- Dimensions are for informational purposes only and are subject to change.
2- 52" Overall height required for FIlter element Removal.



SECTION A-A

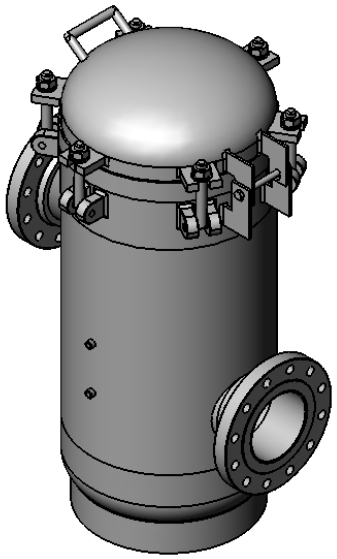


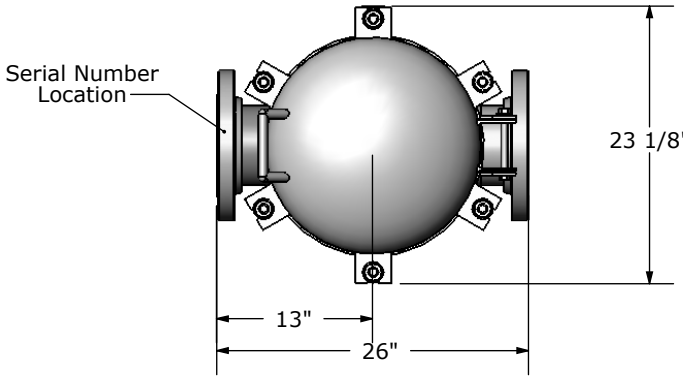




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	9/25/07	TITLE Thompson Strainer MLS-4C-MOD14
	CHECKED			
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



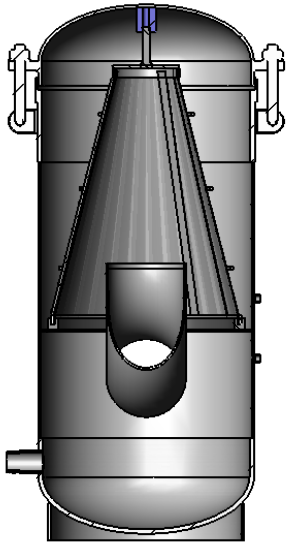


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement)
- Maximum Pressure: 300 PSI
- Maximum Temperature: 135˚ F
- Screen Surface Area 745 Sq. In.

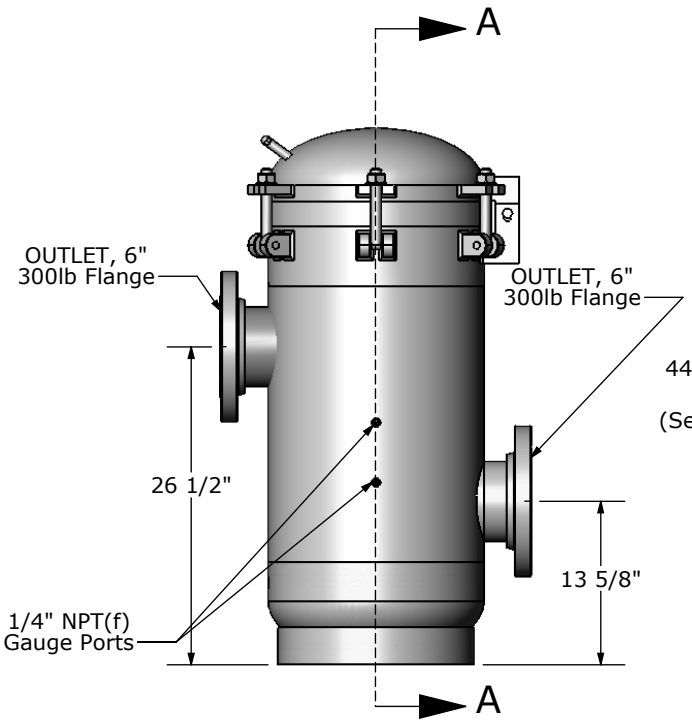
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

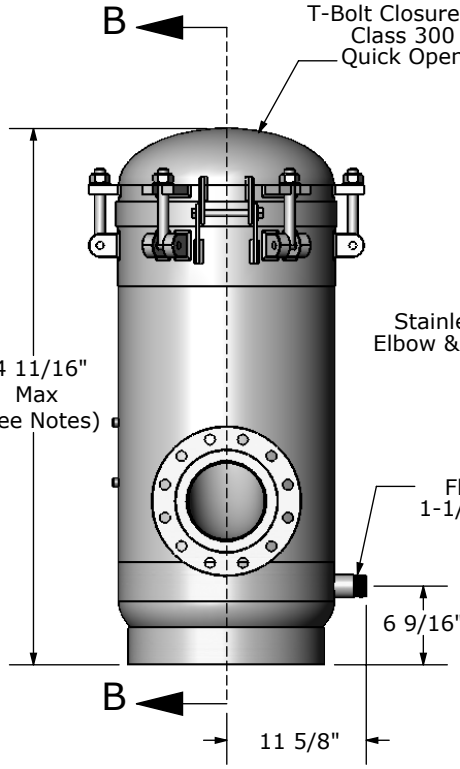
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

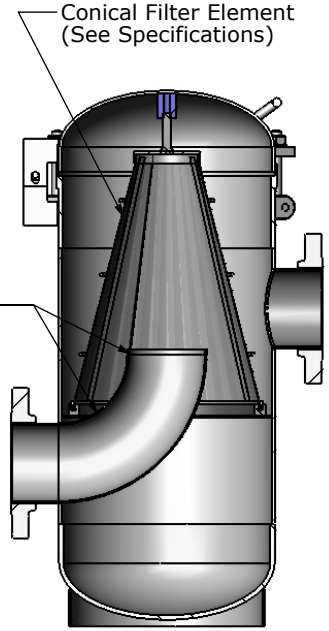
NOTES:
1- Flush Port is available in larger sizes. Bottom Flush Port is also available.
2- Stainless Steel internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 65" Overall height required for filter element removal.



SECTION A-A

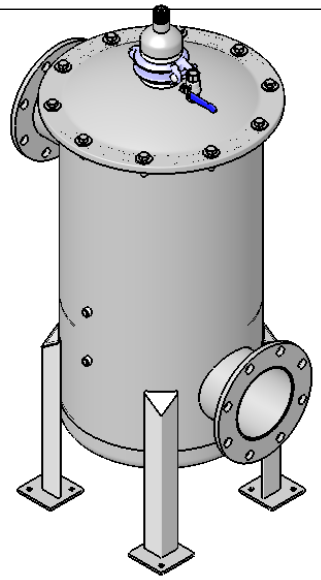


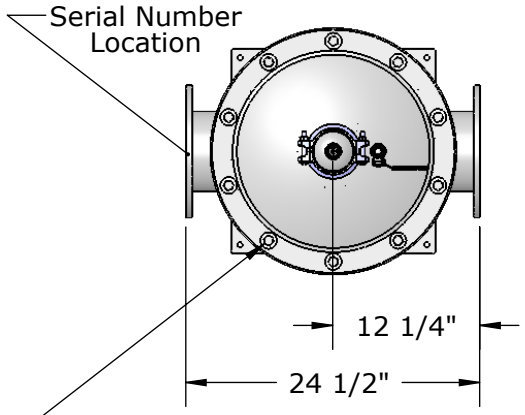




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	6/24/09	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-6-300 PSI
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			REV A
	SHEET 1 OF 1			



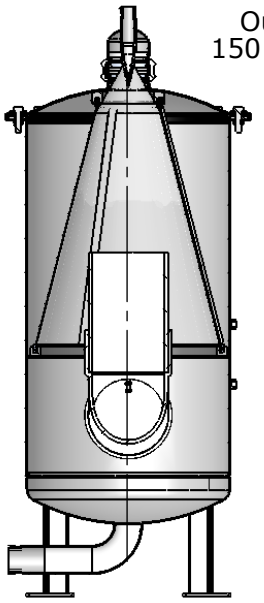


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI
- Maximum Temperature: 135˚ F
- Screen Surface Area 745 Sq. In.

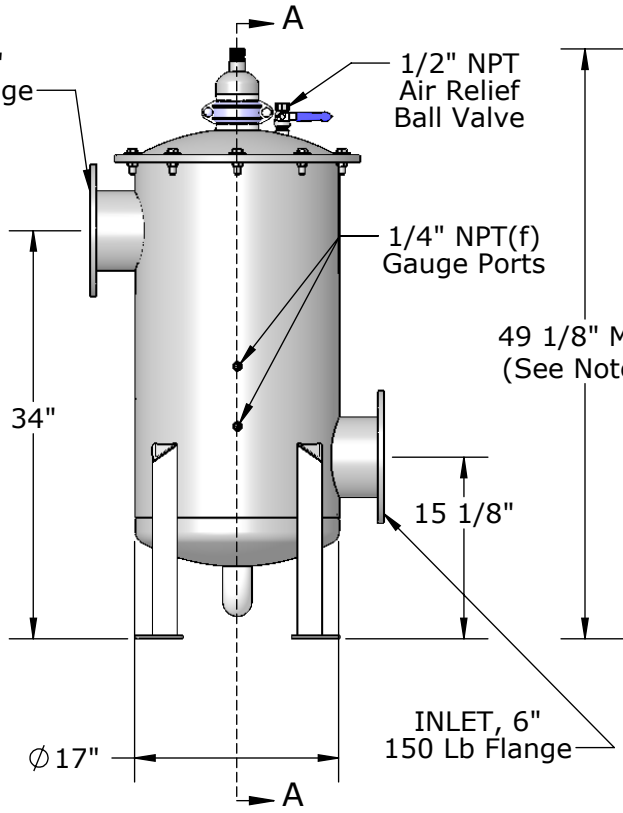
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen: 316 Stainless (1/4" perforated sheet backup)

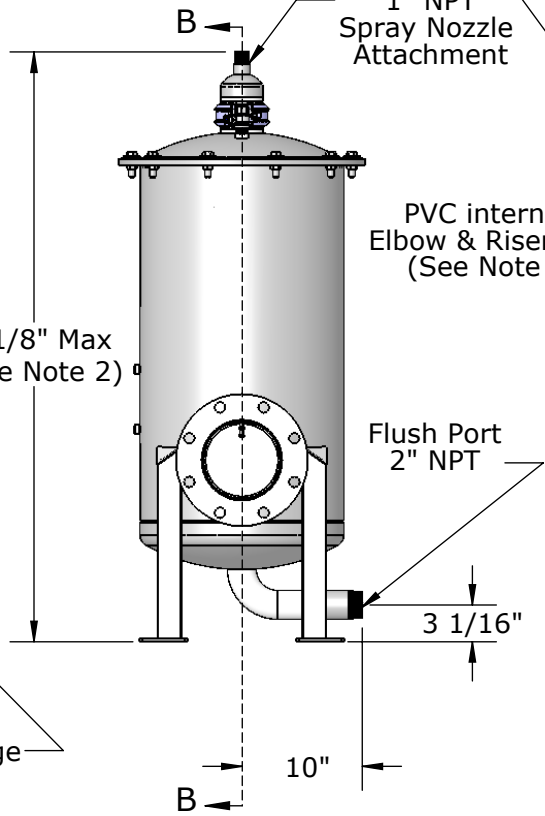
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

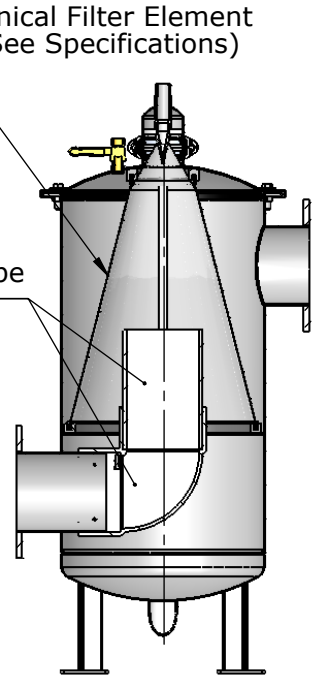
NOTES:
1- Dimensions are for informational purposes only and are subject to change.
2- 21" additional height required for screen removal.



SECTION A-A

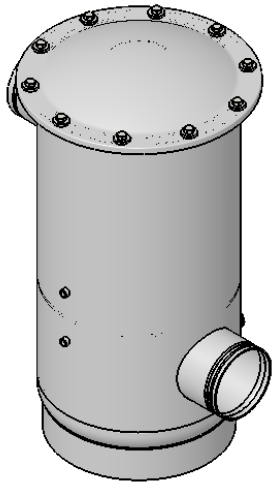


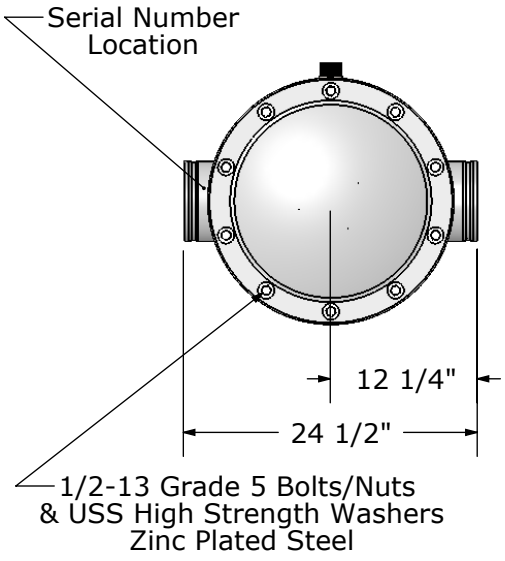




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	04/08/08	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-6-MOD15
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			



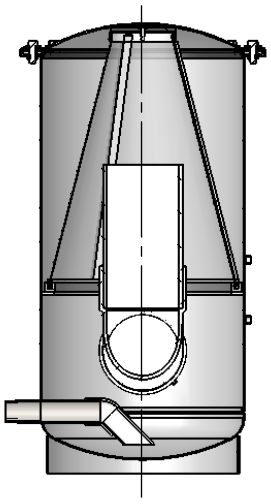


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI
- Maximum Temperature: 135˚ F
- Screen Surface Area 745 Sq. In.

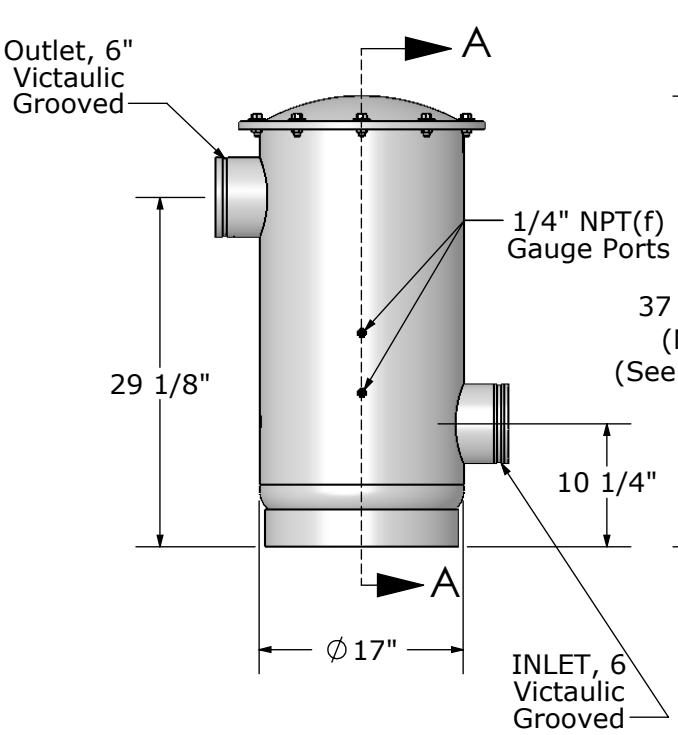
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

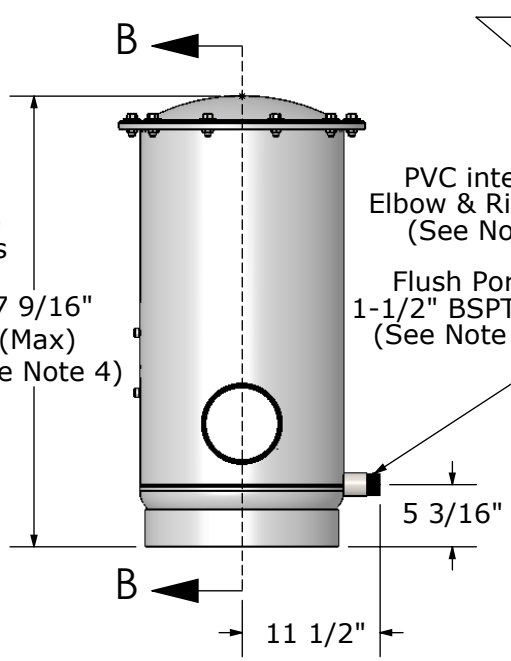
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

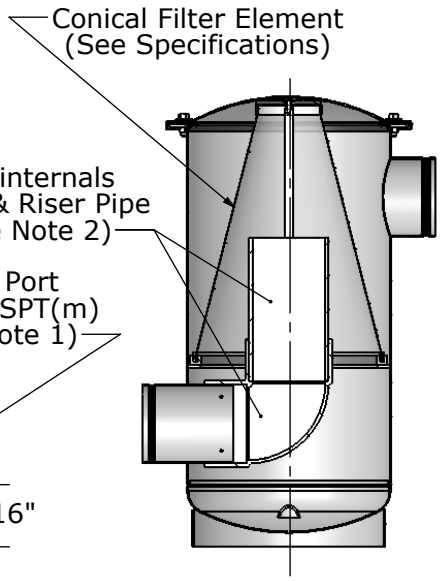
NOTES:
1- Flush Port is available in larger sizes. Bottom Flush Port is also available.
2- Stainless Steel internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 56" Overall height is required for filter element removal.



SECTION A-A

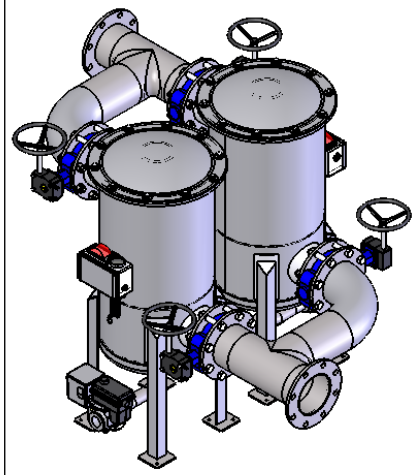


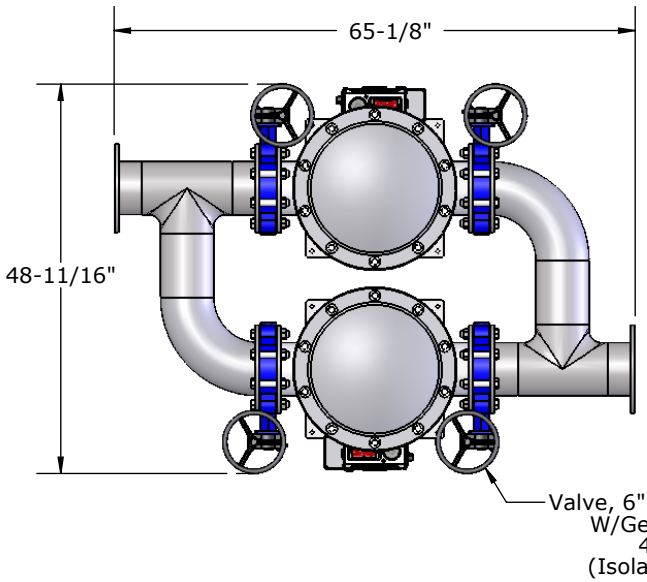




SECTION B-B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	7/17/08	TITLE Thompson Filter MLS-6-MOD19(BSPT)
	CHECKED			
MILLER-LEAMAN INC. 800 Orange Ave. Daytona Beach FL 32114	ENG APPR.			
	MKT APPR.			
	SHEET 1 OF 1			



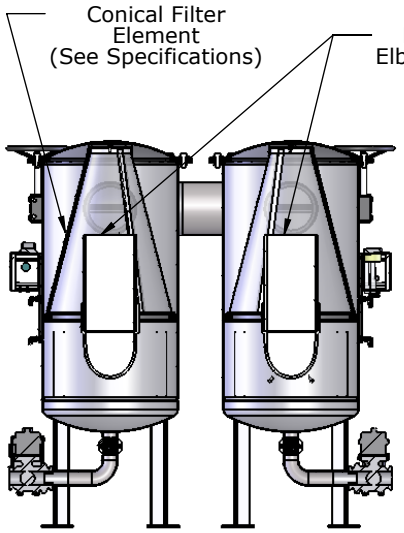


GENERAL SPECIFICATIONS:
- Maximum Flow: 750 GPM (No minimum flow requirement)
- Maximum Pressure: 150 PSI
- Maximum Temperature: 135° F
- Screen Surface Area 745 Sq. In.

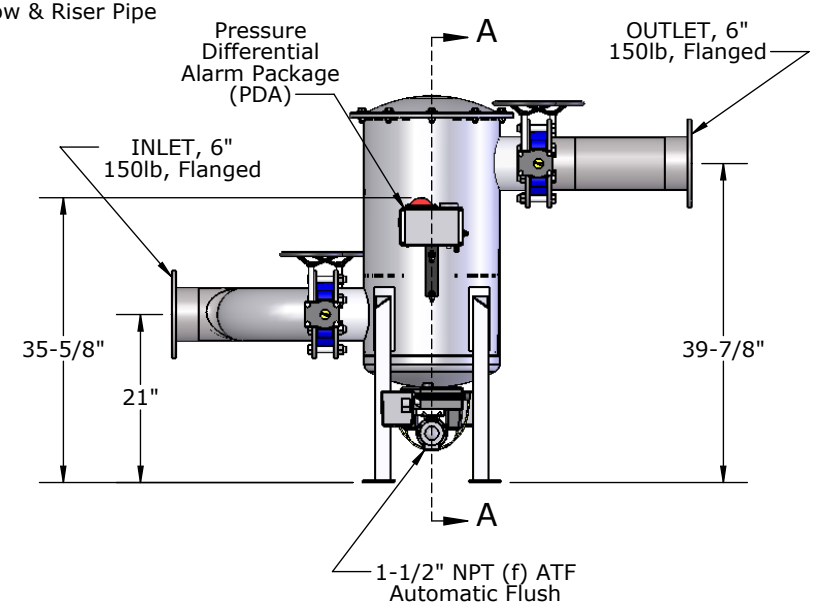
MATERIALS:
- Housing: 304 Stainless standard (316 Stainless optional)
- Gasket: EPDM standard (other compounds available)
- Screen Mesh: 316 Stainless (1/4" perforated sheet backup)

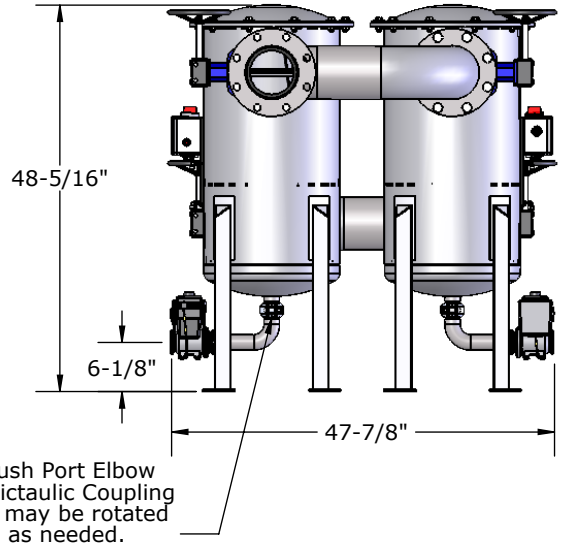
SCREEN OPTIONS:
- Multiple screen mesh and perforated sheet sizes available. (See product catalog for samples)

NOTES:
1- Flush Port is available in larger sizes.
2- Stainless Steel internals (Elbow and Riser Pipe) are also available.
3- Dimensions are for informational purposes only and are subject to change.
4- 69" Overall height required for filter element removal.

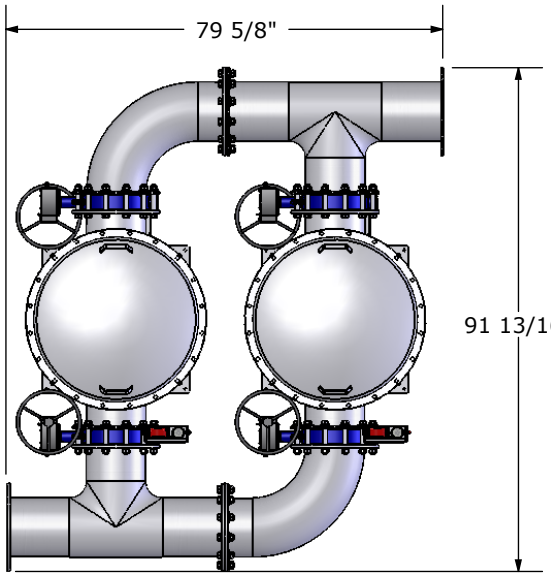


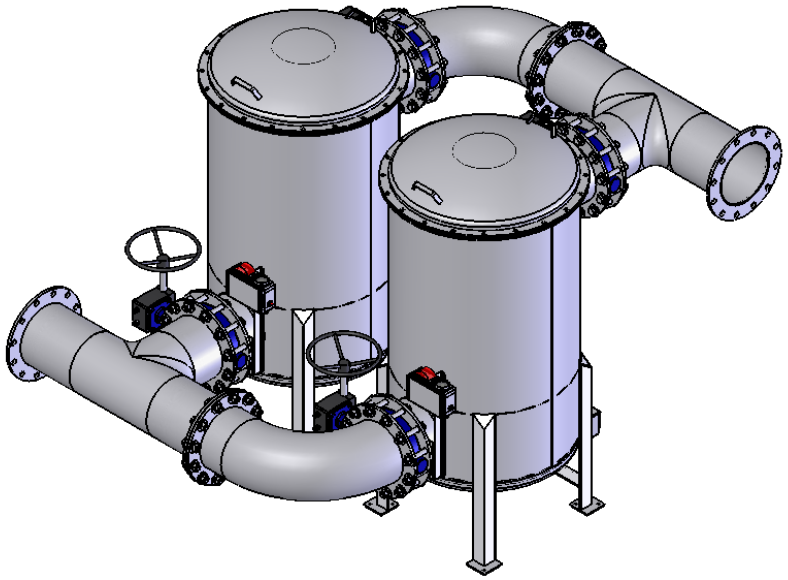
SECTION A-A

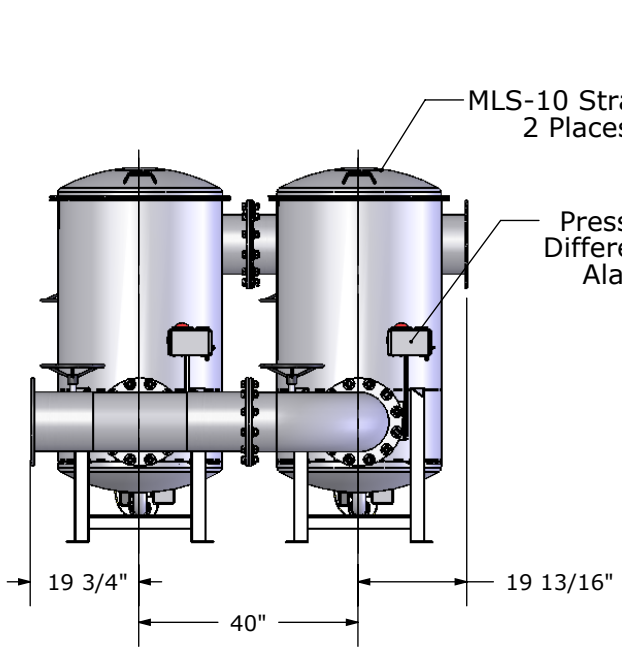


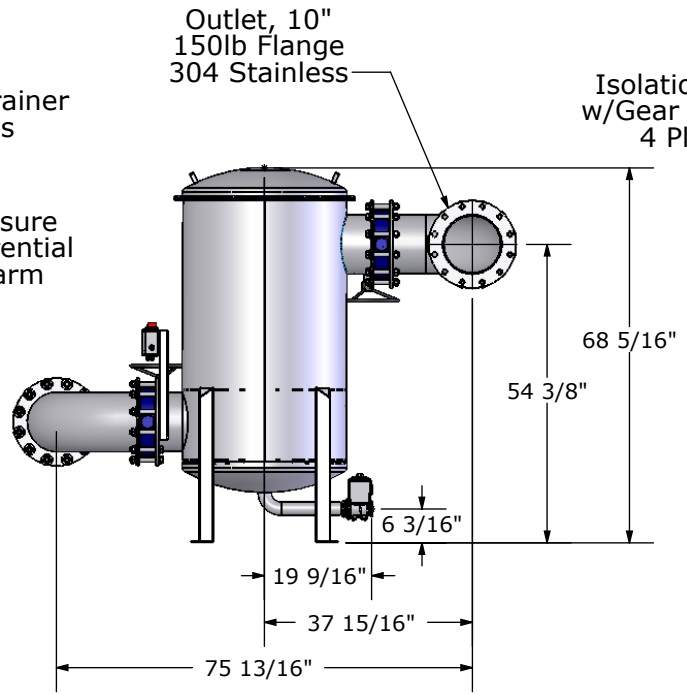


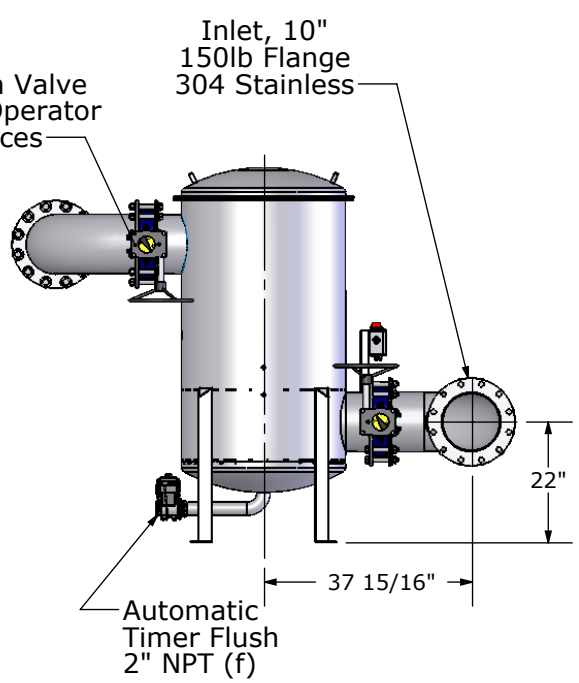
PRODUCT SPECIFICATION	DRAWN	L.Brannan	12/1/10	TITLE
	CHECKED			Thompson Strainer
MILLER-LEAMAN INC.	ENG APPR.			MLS-6-Duplex
	MKT APPR.			
800 Orange Ave. Daytona Beach FL 32114	SHEET 1 of 1	Revised 10-12-11	ML21477	





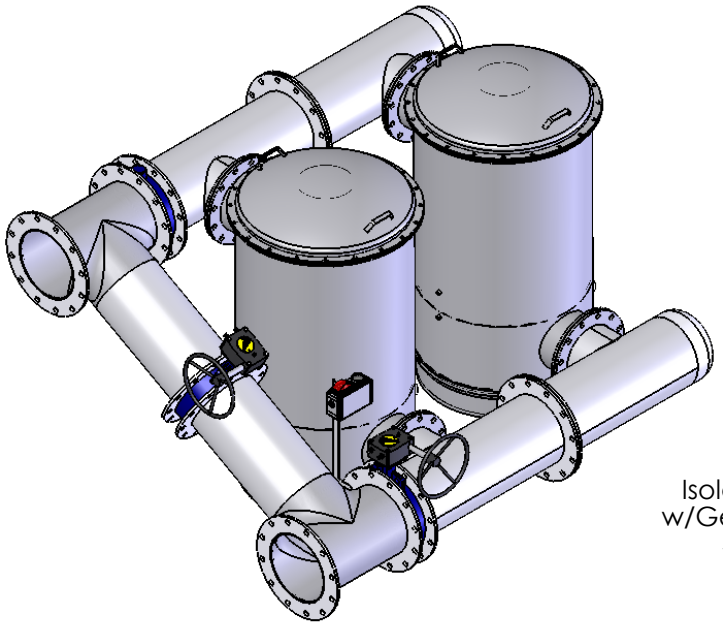


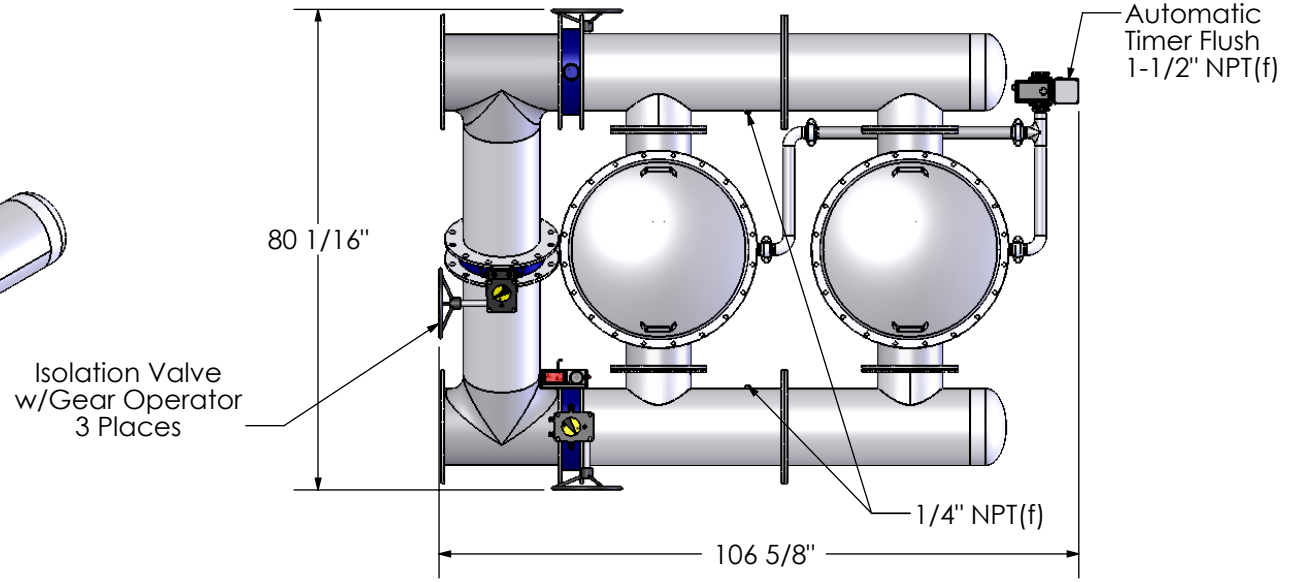


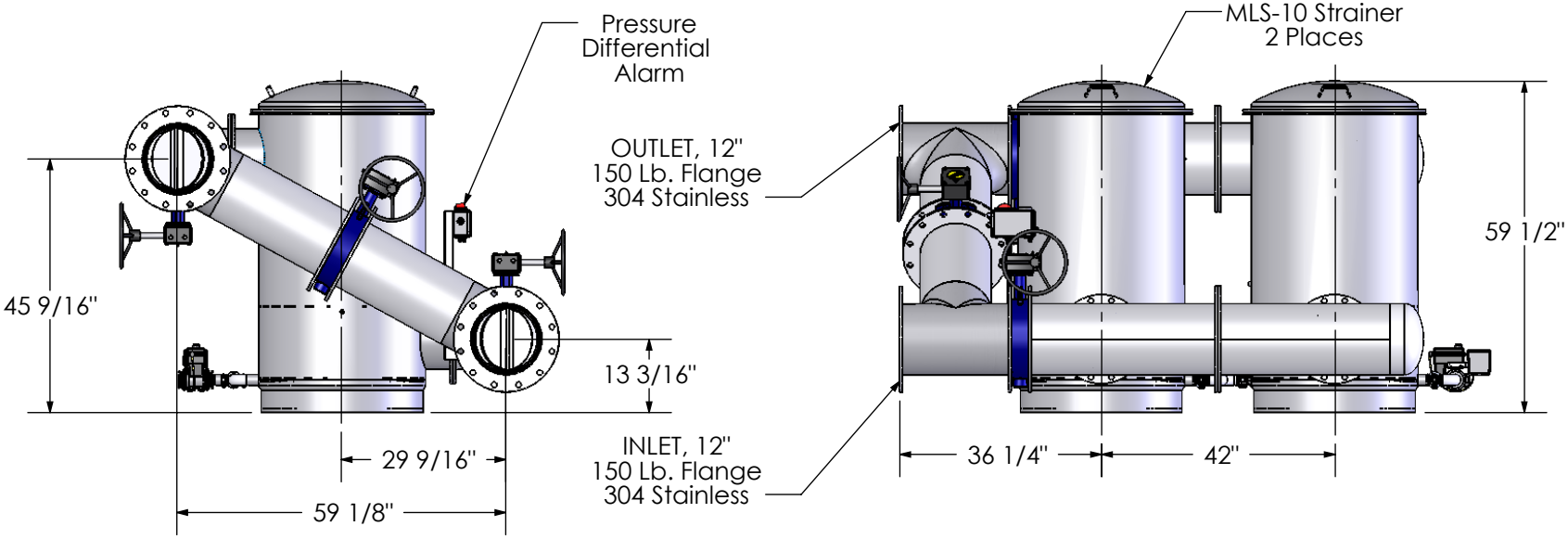


Note:
1) Overall Height of 104" for Filter Removal

PRODUCT SPECIFICATION	DRAWN	L.Brannan	5/20/08	TITLE
	CHECKED			TSM10(2)x10-T304 W/Strainer Isolation Valves
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

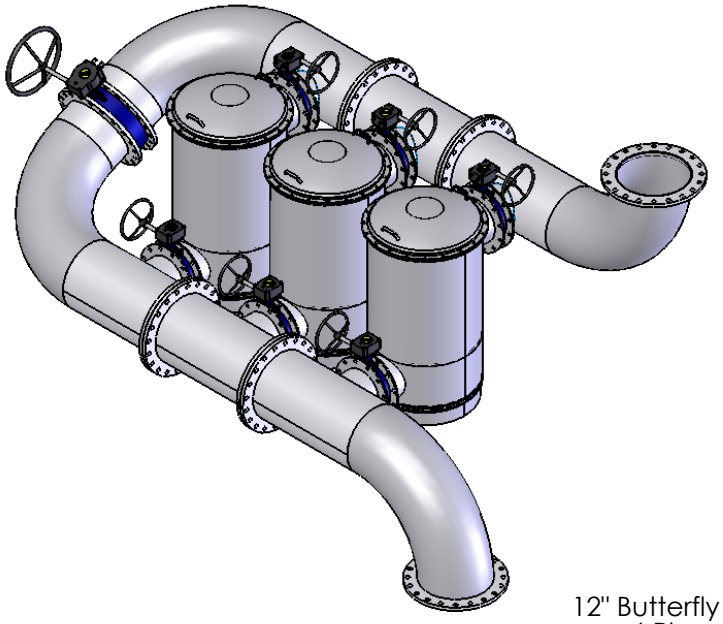


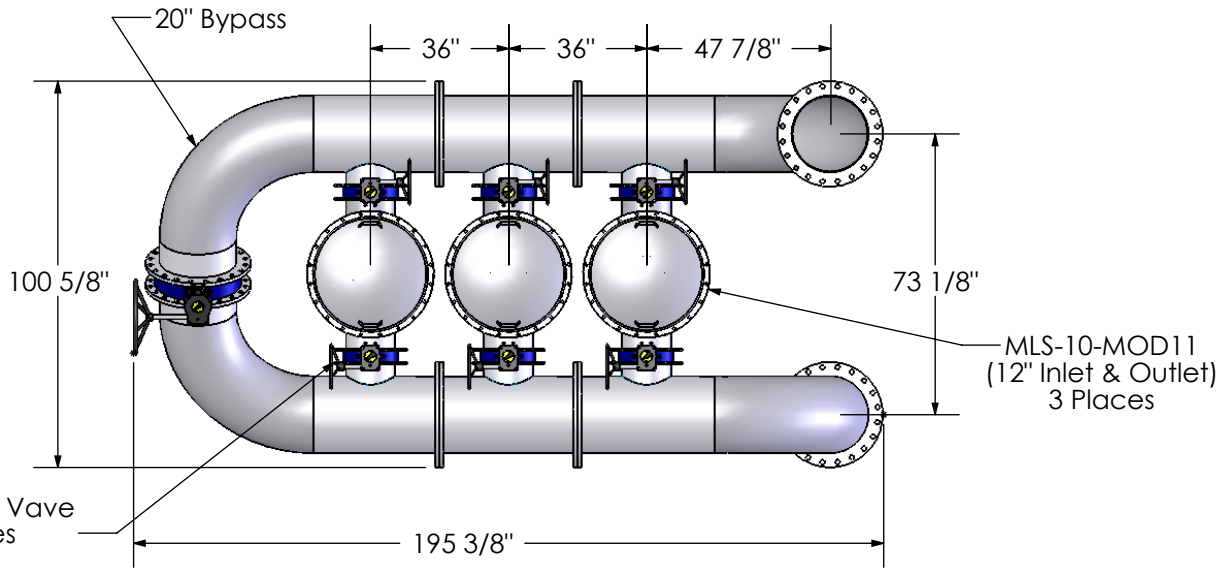


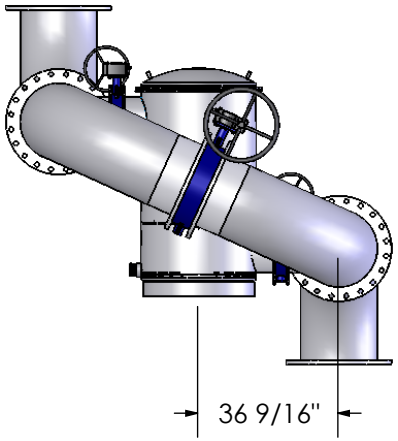


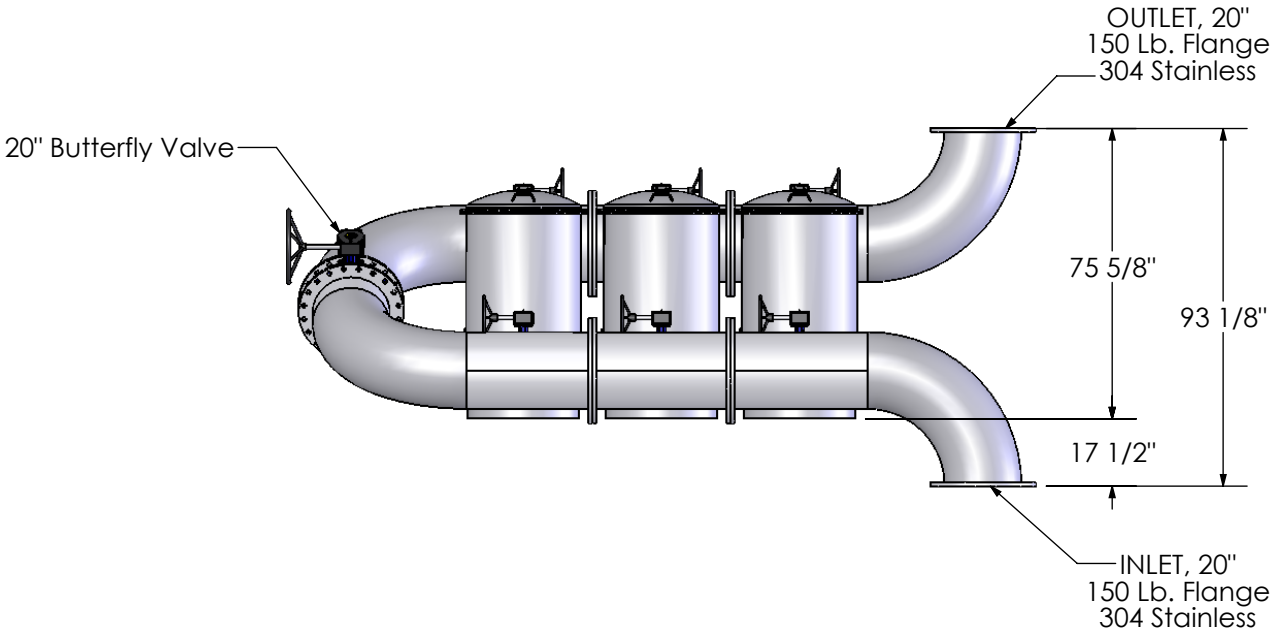
PRODUCT SPECIFICATION	DRAWN	J. Larsen	3/7/08	TITLE
	CHECKED			TSM10(2)x12-T304 w/Strainer Isolation Valves
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED









PRODUCT SPECIFICATION	DRAWN	J. Larsen	12/8/07	TITLE: TSM10(3)x20-T304 w/Strainer Isolation Valves and 20" Bypass
MILLER-LEAMAN INC. 800 Orange Ave. Daytona Beach FL 32114	CHECKED			
	ENG APPR.			
	MKT APPR.			
	SHEET 1 OF 1			

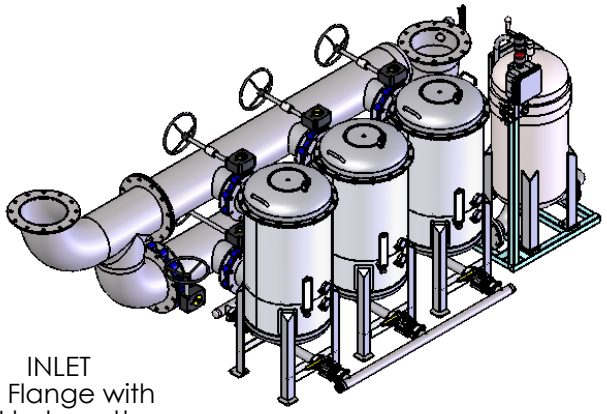
GENERAL SPECIFICATIONS:
- Maximum Flow: 1700 GPM
- Maximum Pressure: 125 PSI
- Screen Surface Area 1560 Sq. In. per Strainer x 3 = 4680 Sq. In.
- Maximum Water Temperature: **200° F**

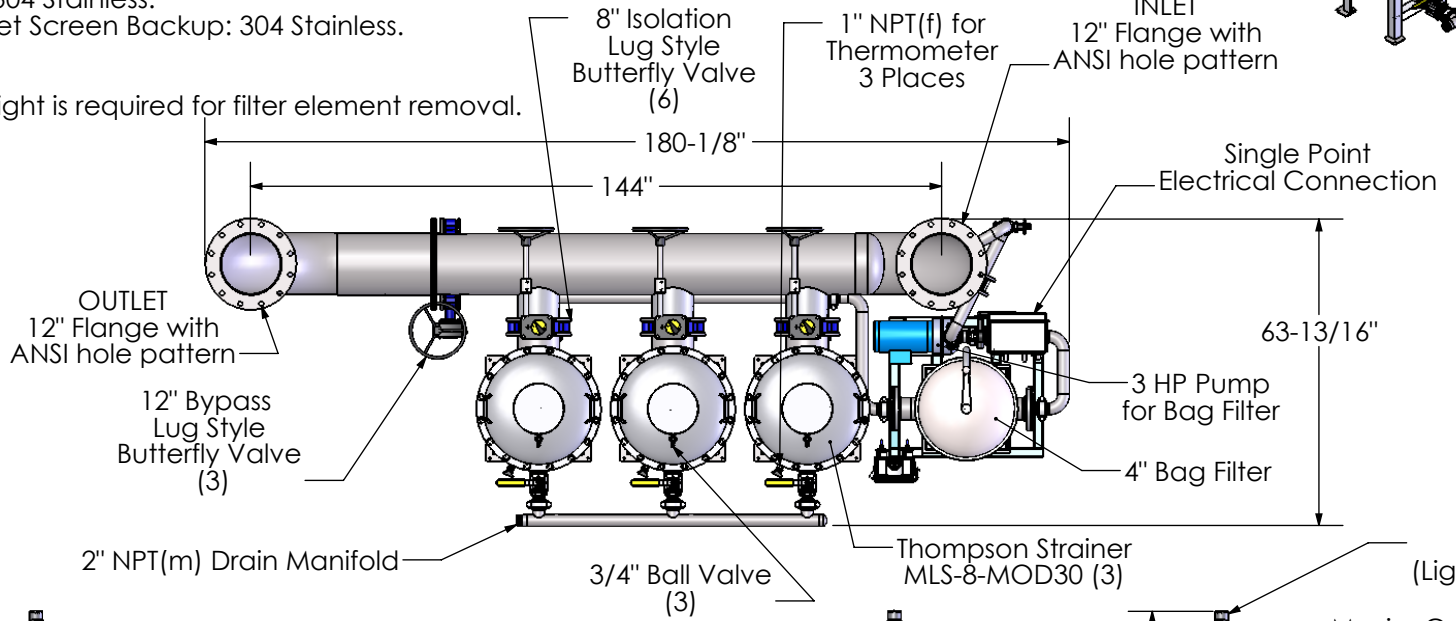
WARNING! This water temperature can result in serious personal injury or death.
End user must provide and adhere to strict safety standards.

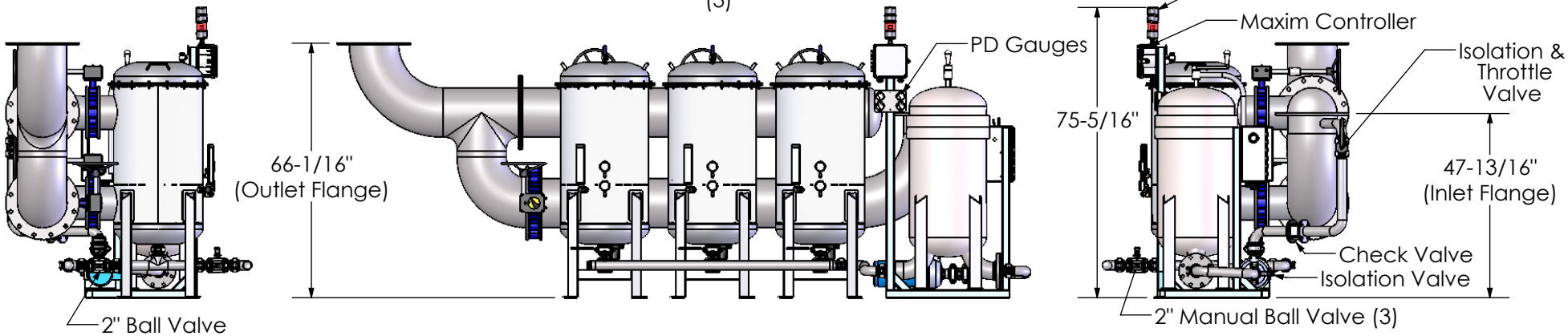
Seller _____ End User_____

MATERIALS:
- Housing: 304 Stainless
- Gasket: EPDM
- Screen Mesh: 304 Stainless.
- Perforated Sheet Screen Backup: 304 Stainless.

NOTES:
1- 80" Overall height is required for filter element removal.







ELECTRICAL REQUIREMENTS:
460VAC, 3 Phase, 5 Amps

PRODUCT SPECIFICATION

MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

DRAWN	J. Larsen	9/12/11	TITLE
CHECKED			8" Thompson 3 Pod Filter System
ENG APPR.			
MKT APPR.			
SHEET 1 OF 1	Ref: ML21517	Rev. F	

MILLER LEAMAN INC

HOMPSON Strainer

OWNER'S MANUAL

Serial # _____

The Serial # is located on the top of the outlet flange or pipe.

Table of Contents

I. SAFETY CONSIDERATIONS

GENERAL WARNING

Ensure all appropriate personnel read owner's manual prior to installation and/or operation of strainer. Failure to comply with instructions and safety precautions could lead to personal injury or product damage. Please call (386) 248-0500 and ask to speak with one of our customer service representatives if there are any questions.

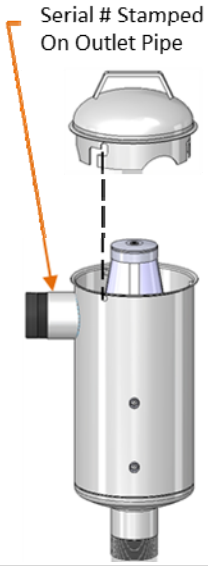
CAUTION

Always wear Personal Protective Equipment (PPE) - Eye protection, Ear protection, gloves, and protective footwear.

1. **AT NO TIME SHOULD THE INTERNAL PRESSURE EXCEED THE MAXIMUM RATED PRESSURE OF THE STRAINER. Refer to maximum pressure rating decals located on the strainer.**
2. **Under no conditions should the strainer lid or pressure gauges be removed while the strainer is pressurized.**
3. All strainers with a side inlet and a bottom foot ring must be placed on a firm supporting surface. **DO NOT** suspend the strainer by the inlet and outlet connections. All strainers with vertical inlet piping must be plumbed into properly supported piping.
4. Units with damaged or missing parts should **NEVER** be operated. Contact customer service representatives for replacement parts.
5. Back-flow prevention devices should be installed upstream of the inlet and downstream of the outlet of the strainer to prevent back flow or vacuum effects that can be damaging to the strainer.
6. Pressure relief valves of a sufficient size and volume should be installed upstream of the inlet and downstream of the outlet of the strainer. They should be set so the system never exceeds the maximum rated pressure. It is recommended that the set point is approximately 20% higher than the operating pressure. Failure to install relief valves could lead to personal injury or product damage.

II. RECEIVING & INSTALLATION

1. Inspect strainer to ensure there is no damage from transit.
2. Confirm all dust plugs/flange protectors (inlet, outlet, gauge ports, etc.) are removed.
3. Locate serial number on top of outlet flange or pipe (see diagrams below) and record in the box on page 1.
4. Position the strainer into the piping system using the red arrows to indicate flow path.
5. All strainers with a side inlet and a bottom foot ring must be placed on a firm supporting surface. DO NOT suspend the strainer by the inlet and outlet connections. All strainers with vertical inlet piping must be plumbed into properly supported piping.
6. Installation of isolation valves on both the inlet and outlet sides of the strainer is recommended to isolate the strainer during maintenance.
7. Install a valve on the drainage port located at the bottom of the strainer body (see diagram below). The valve must be plumbed to atmosphere and the flush line should not have any elevation or be piped to a pressurized line.
8. Ensure pressure gauges (sold separately) are installed in the gauge ports located on the strainer body (see diagram below). These gauges will allow you to monitor the pressure differential across the screen.
9. Review all safety considerations from Section I. to determine if they have all been addressed.
10. Ensure all strainer openings are properly connected.
11. Ensure the lid is properly installed. See diagram below and Section IV. Torque Recommendations for instruction.



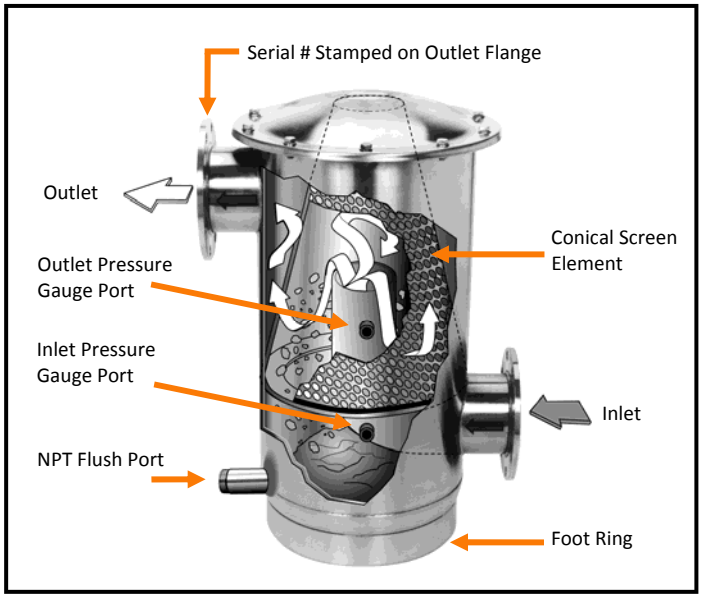
Clamped Lid Operating Instructions:

<u>To Close -</u>

- Align vertical slots in the lid assembly with the pins inside the housing.
- Lower the lid assembly until it can be rotated.
- Rotate the lid assembly clockwise to stop. The head will drop into a locked position and should be unable to be removed by pulling straight up.
- Install the V-Band clamp.

<u>To Open -</u>

- Remove the V-Band clamp.
- Using the handle on top of the head; pull up and rotate the lid assembly counter-clockwise until the head is free from the locking pins.



III. STRAINER OPERATION, MAINTENANCE, & STORAGE

	CAUTION
⚠	Check gauges to ensure the internal pressure of the strainer is relieved before removing the retaining bolts/clamp of lid.

<u>Start up</u>

Open the downstream valve, then slowly allow fluid to flow through the strainer by opening the upstream valve.

<u>Flushing</u>

Periodically (depending on liquid quality) the debris that settles out at the bottom of the strainer will need to be flushed out. Open the flush port valve while the strainer is in operation to flush out debris. Flow rate, pressure, and amount of debris determine how long the valve should be open to flush the debris from the strainer tank. It is the user's discretion to determine the frequency that the valve should be opened. **Never** allow debris to accumulate beyond the capacity of the reservoir.

Cleaning

A pressure differential of approximately 5-7 PSI from the clean condition indicates that the screen requires cleaning. Please note that you must maintain an inlet pressure that is higher than the pressure differential to maintain flow.

Step 1: Check gauges to ensure the internal pressure of the strainer is relieved before removing the retaining bolts/clamps of lid.

Step 2: Remove the lid of the Thompson Strainer.

Step 3: Lift the strainer element (conical screen) out of the strainer body.

Step 4: Carefully scrub down the strainer element with a rigid nylon brush until all matter is loosened. ***Do not use a steel brush.***

Step 5: Wash the strainer element off with clean water. ***Do not use a pressure washer.***

Step 6: Rinse gaskets and clean the inner-ring where the bottom of the strainer element seals.

Step 7: Make sure the U-shaped gasket is fitted securely to the bottom of the strainer element. Position the strainer element into the body of the strainer.

Step 8: Make sure the strainer head gasket is installed on the upper flange of the top of the housing. On V-Band models, the o-ring should be seated completely in the head assembly. Position the strainer lid back on the strainer body. Tighten the lid following the Torque Recommendations.

Storage (Not in Service)

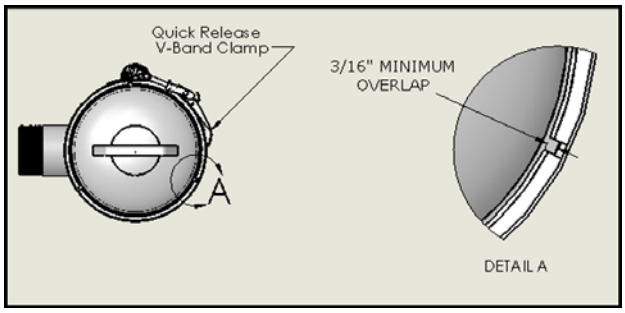
When the strainer is not in service, Miller-Leaman recommends the following to prevent premature deterioration of the strainer housing and screen.

- Isolate the strainer to ensure no flow and release pressure.
- Drain the strainer body by opening the flush port. Remove the internal screen and gaskets, and thoroughly rinse them with clean fresh water. Rinse out the inside of the strainer body with clean fresh water. Remove any excess water.
- The strainer is not freeze protected. Proper freeze protection steps must be taken to ensure the strainer will not be damaged if exposed to freezing conditions.

IV. TORQUE RECOMMENDATIONS

BAND CLAMP MODELS:

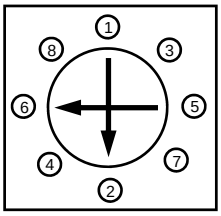
The over-center latch clamp is used on the band clamp models and is installed by placing the clamp around the strainer, latching the T-bolt with the receiver, then pushing the latch handle towards the strainer body until the safety catch engages. The over-center clamp does not require adjustment to be installed and removed. The lock nut is set at the factory for proper clamp compression and normally requires no initial field adjustment. Minor adjustments may be necessary over time. When tightening the lock nut, ensure that the clamp is compressing the o-ring to seal joint while not creating an excessive amount of latch handle closing force. When the clamp is closed, there should be a minimum overlap of 3/16" between the clamp inside diameter and the outside diameters of both the lid and housing flanges. (see diagram)



BOLTED LID MODELS:

The bolted lid *Thompson Strainers* require that the attachment bolts be tightened sufficiently to make a complete seal without damaging the bolts or the strainer head. Bolts, nuts and washers are used to attach the heads to these strainers. The size and recommended torque of the bolt is dependent on the strainer size. The following table shows the bolt size and torque rating for each strainer.

Model	Bolt Size	Bolt Quantity	Torque
4" Bolted	(3/8"-16)	10	15 to 25 ft. lbs.
6"	(1/2"-13)	10	45 to 55 ft. lbs.
8"	(1/2"-13)	15	45 to 55 ft. lbs.
10"	(5/8"-11)	20	80 to 100 ft. lbs.



Recommended Torquing Sequence

NEVER operate the strainer unless all bolts are properly fastened. It is important to follow the torque recommendations as over-torquing may result in premature failure of the bolt. When tightening the bolted lid, follow the recommended torque sequence above. Complete the torque sequence 2 times.

V. INFORMATION CONCERNING WATER HAMMER

WHAT IS WATER HAMMER?

Water hammer is a phenomenon that can occur in fluid systems with long pipes between the fluid source and the outlet. The term itself refers to the sound made when water hammer occurs which resembles banging a hammer on a long pipe. Water hammer is a rapid change of pressure caused by a rapid change in velocity. When the velocity is changed a pressure wave that travels at the speed of sound is initiated and travels in the upstream direction until it reaches some stationary energy level, like a reservoir. A rarefaction wave (at the pressure of the water source) then travels downstream at the same speed. If the flow has been shut off down stream the pressure wave impacts the blockage and the pressure in the entire system is raised very quickly.

WHAT CAUSES WATER HAMMER?

Any action that can cause a rapid change in the velocity of the flow can set off a water hammer - closing a downstream valve, pipe fracture, pump stoppage, etc. The critical time for which a valve may be closed depends on the length of piping between the valve and the source reservoir. The longer the distance the slower the valve may be shut to cause a water hammer. Typically for short lengths of pipe (below 500 ft) the critical time is less than 1/10 second.

WHAT CAN WATER HAMMER DO?

Pressure spikes from water hammer can raise fluid pressures to very high values (in excess of 1000 PSI depending on the situation). Such pressure spikes can result in mechanical failures such as broken valves, pipes, strainers, joints, etc. Water hammer does not have to occur fully to raise the pressure. A partial hammer can occur that raises the pressure to a certain percentage of the theoretical maximum. The Thompson Strainer is rated to an absolute maximum pressure of 150 PSI for bolted lid models, 125 PSI for band clamp lid models. A water hammer pressure spike that raises the pressure higher than the maximum rated pressure may result in strainer damage.

WHAT CAN I DO TO PREVENT WATER HAMMER?

There are precautions that can be taken to prevent or decrease the effect of water hammer. A pressure relief valve that leads to a surge tank or accumulator may protect other key components from water hammer. A close adherence to operational policies will also help prevent valves or pumps from being accidentally shut off thereby causing a water hammer. A close examination of a system will inform you of potential hazards.

VI. LIMITED WARRANTY

This Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

Miller-Leaman warrants its products against defects in material and workmanship under normal use and service for which such products were designed for a period of twelve(12) months after shipment from our factory. Our sole obligation under this warranty is to repair or replace, at our option, any product or any part or parts thereof we find to be defective.

SELLER MAKES NO OTHER REPRESENTATIONS OR WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

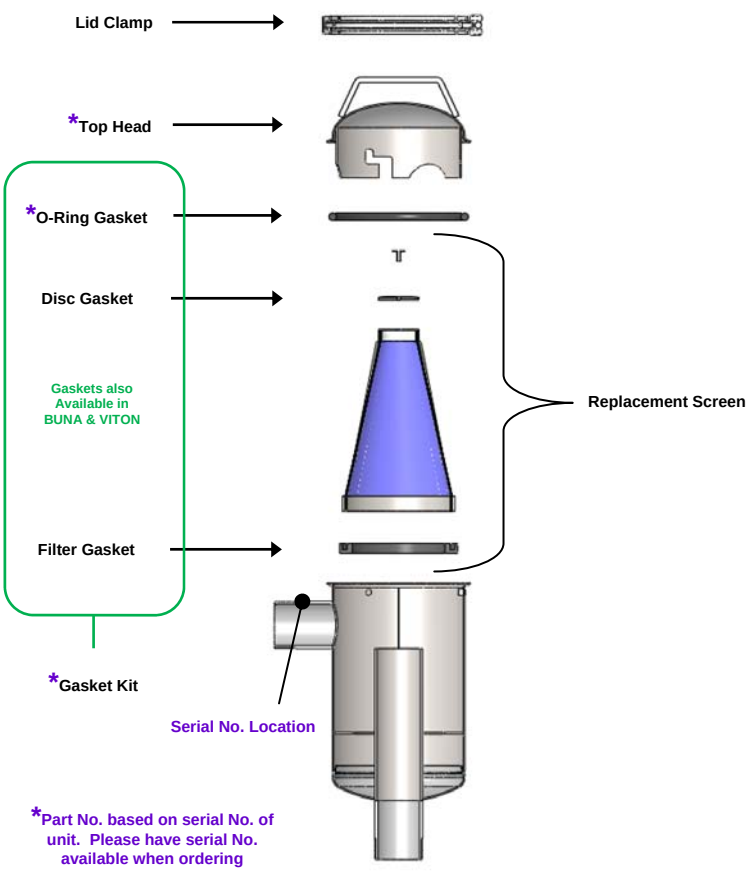
The warranty set forth above is the only warranty applicable to Miller-Leaman products. Our maximum liability shall not in any event exceed the contract price for the product.

IN NO EVENT SHALL MILLER-LEAMAN BE LIABLE FOR ANY DELAY, WORK STOPPAGE, CARTAGE, SHIPPING, LOSS OF USE OF EQUIPMENT, LOSS OF TIME, INCONVENIENCE, LOSS OF PROFITS OF ANY DIRECT OR INDIRECT INCIDENTAL OR CONSEQUENTIAL LOSS OR DAMAGES RESULTING FROM OR ATTRIBUTABLE TO THE USE OF THE PRODUCT.

This warranty is governed by the Laws of the State of Florida. Venue and jurisdiction of any case or controversy related to the use of the product shall lie exclusively in the State Courts of Volusia County, Florida.

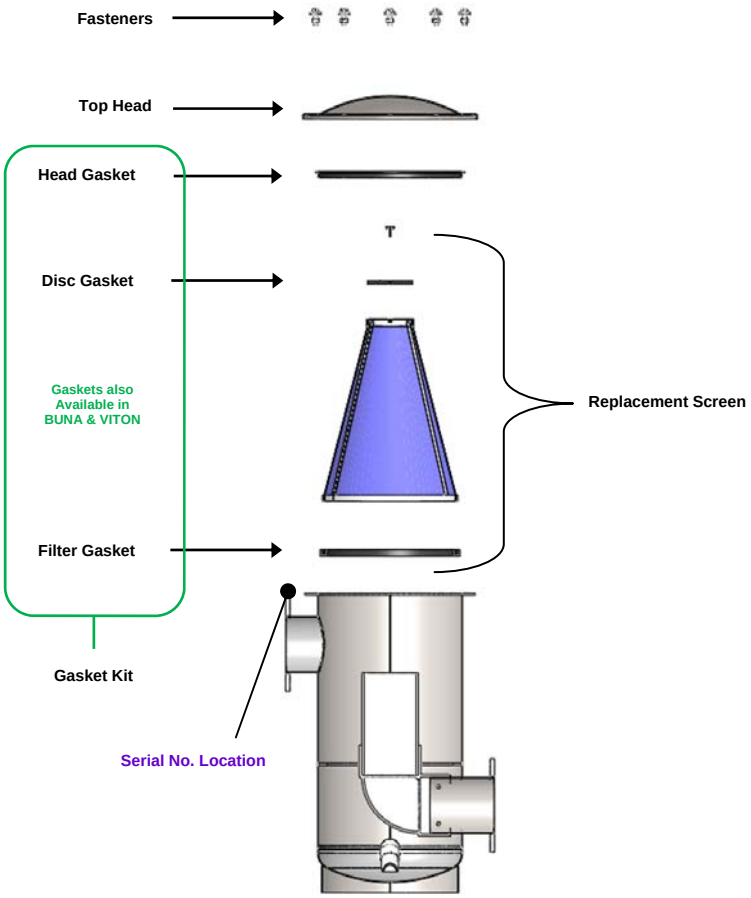
VII. SPARE PARTS

Thompson Strainer - 2" thru 4C"



*Part No. based on serial No. of unit. Please have serial No. available when ordering

Thompson Strainer - 4B" thru 10"



	STRAINER		REPLACEMENT PARTS						
	Model Number	Inlet/Outlet Size & Type *	Replacement Screen (a)	Head/O-Ring Gasket (EPDM)	Filter Gasket (EPDM)	Disc Gasket (EPDM)	Gasket Kit (b) (EPDM)	Top Head	Lid Clamp or Fasteners
BAND CLAMP LID	MLS-02-XXX	2" NPT	P/N: 2S-XXX	OR-02 / OR-02-2 (Select P/N from Table 1 below)	FG-02	DG-02	GK-02 / GK-02-2 (Select P/N from Table 1 below)	TH-02 / TH-02-2 (Select from Table 1)	BC-02
	MLS-03-XXX	3" NPT	P/N: 3S-XXX	OR-03 / OR-03-2	FG-03	DG-03	GK-03 / GK-03-2	TH-03 / TH-03-2	BC-03
	MLS-04C-XXX	4" Flanged	P/N: 4S-XXX	OR-04 / OR-04-2	FG-04	DG-04	GK-04 / GK-04-2	TH-04C	BC-04
BOLTED LID	MLS-04B-XXX	4" Flanged	P/N: 4S-XXX	HG-04	FG-04	DG-04	GK-04B	TH-04B	FASTENERS-04
	MLS-06-XXX	6" Flanged	P/N: 6S-XXX	HG-06	FG-06	DG-06	GK-06	TH-06	FASTENERS-06
	MLS-08-XXX	8" Flanged	P/N: 8S-XXX	HG-08	FG-08	DG-08	GK-08	TH-08	FASTENERS-08
	MLS-10-XXX	10" Flanged	P/N: 10S-XXX	HG-10	FG-10	DG-10	GK-10	TH-10	FASTENERS-10

Table 1

Select proper O-Ring, Gasket Kit, and/or Top Head corresponding to serial number stamped on strainer outlet pipe/flange.

Strainer Model	Serial No.	Part Number	Serial No.	Part Number
MLS-2	0001-4999	OR-02 / GK-02 / TH-02	5000 & higher	OR-02-2 / GK-02-2 / TH-02-2
MLS-3	0001-1999	OR-03 / GK-03 / TH-03	2000 & higher	OR-03-2 / GK-03-2 / TH-03-2
MLS-4C	0500-1999	OR-04 / GK-04	2000 & higher	OR-04-2 / GK-04-2

SCREEN OPTIONS: "XXX" (in above part numbers) = MESH or PERFORATED SIZE of SCREEN

Complete Strainer and Replacement Screen orders must specify mesh or perforated size of screen. See catalogue for micron equivalent to mesh. Consult factory for assistance.

Screen Mesh Options: Standard Mesh - **16, 20, 30, 40, 50, 60, 80, 100, 120, 150, 200**

Heavy-Duty Mesh - **24x110, 30x150, 40x200, 50x250** (Dutch-weave screens: heavier wire gauge, lower open area %)

Perforated Options: **1/4", 1/8", 1/16"**

VIII. OPTIONAL EQUIPMENT

OPTIONAL EQUIPMENT

Please note that the following equipment is not included with the purchase of the strainer. Please call for information and pricing.

Pressure Differential Alarm Package (PDA)

- Continuously monitors the pressure drop across the conical screen.
- Visual and audio alarm.
- (1) dry output contact.

Automatic Timer Flush Package (ATF-EA-1.5)

- Automatically purges particles that have gravitated down into the debris reservoir at the base of the strainer.
- Dial in frequency and duration.
- 110V / 12VDC power supply included.

***Full Cone* Spray Nozzle Assembly Option**

- **Rinse particles off the screen.**
- **Decrease frequency of screen maintenance.**

MILLER LEAMAN INC
Pure Filtration Solutions.

800 Orange Avenue, Daytona Beach, FL 32114
Phone: (386) 248-0500 / Fax: (386) 248-3033

Office Hours: 8 AM – 5 PM Eastern Time
Web: www.millerleaman.com
Email: sales@millerleaman.com

MILLER-LEAMAN, INC.
800 ORANGE AVENUE • DAYTONA BEACH, FL 32114
(800) 881-0320 • (386) 248-0500 • Fax: (386) 248-3033
Web: www.millerleaman.com • Email: sales@millerleaman.com

With ***Full Cone*** Spray Nozzle Assembly Option

ADDENDUM

to

Thompson Strainer

OWNERS MANUAL

OPERATION AND INSTRUCTION GUIDE

IMPORTANT:

Please make certain that persons who are to use this filter thoroughly read and understand the **Thompson Strainer** Owners Manual Operation, Instruction Guide and this Addendum prior to operation. Should you have any questions regarding the operation of this filter, please call (386) 248-0500 and ask to speak with one of our customer service representatives.

I. Safety Precautions

Safety precautions are essential when any filtration equipment is involved. These precautions are necessary when using, storing, and servicing your strainer. If safety precautions are overlooked or ignored, personal injury or product damage can occur.

II. Requirements

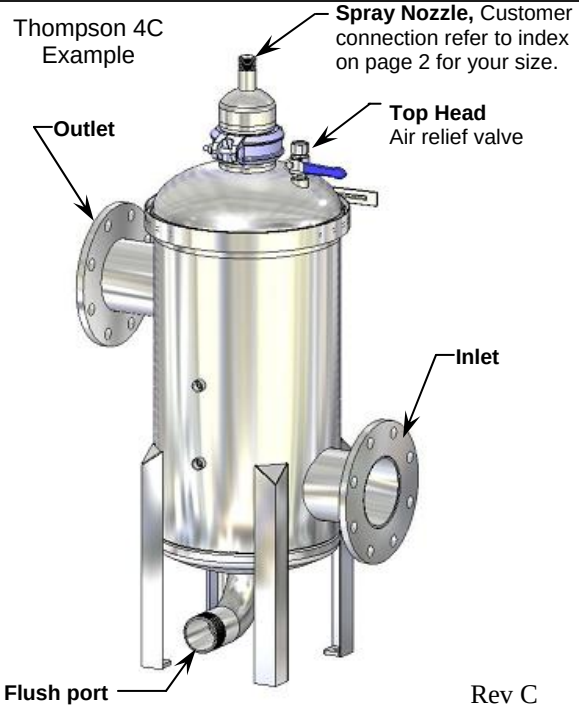
1) Isolation valves must be installed at the **INLET**, **OUTLET**, **FLUSH PORT** and in-line to the **Spray Nozzle** connection.
2) It is recommended the minimum supply line pipe size and required pressure to the Spray Nozzle customer connection is followed for proper operation and maximum performance.
3) Reference Sections ***IV & V*** on Page 2 for the Spray Nozzle data and supply pipe line connection size.
4) Any connections not meeting the minimum supply line pipe size & required pressure should contact Miller Leaman Inc. for further recommendations.

II. Strainer - Isolation for Screen Element Rinsing.

1) **INLET** - Close isolation valve to the strainer inlet.
2) **OUTLET** - Close isolation valve to the strainer outlet.
3) **FLUSH PORT** - Open isolation valve to the flush port. This will allow dirty water to start draining out of the strainer.
4) **TOP HEAD** - Open air relief valve installed on the top head assembly. This will break the vacuum allowing the strainer to drain more rapidly out of the flush port.
5) **SPRAY NOZZLE** - Open valve installed in-line to the full cone spray nozzle assembly connection. This will allow water to enter the spray nozzle and start rinsing particles off the surface of the screen and down to the flush port. It is suggested that a clear section of tubing be installed in-line to the flush port if possible to visually see particulate and determine the length of time needed for proper cleaning of the internal screen element for your particular application.

*(NOTE: The inlet and outlet isolation valves are to remain closed during the **Full Cone Spray Nozzle** rinsing process.)*

Thompson 4C Example



Rev C

III. Strainer - Return to Filtration

1) **SPRAY NOZZLE** - Close isolation valve installed in-line to the ***Full Cone Spray Nozzle*** assembly.
2) **INLET** - Slowly open isolation valve inlet for approximately 15 seconds, close isolation valve. This will aide in flushing particulate out of the riser pipe and screen assembly.
3) **OUTLET** - Open isolation valve to the strainer outlet.
4) **INLET** - Slowly open isolation valve to inlet.
5) **FLUSH PORT** - Close isolation valve to the flush port.
6) **TOP HEAD** - Close air relief valve after air has vented from the strainer.

IV. Spray Nozzle Data

Thompson Strainer	Customer Connection	Spray Nozzle Pipe Size		CAPACITY SIZE	ORIFICE DIA	FREE PASSAGE DIA	CAPACITY-GPM		
MODEL	NPT(M)	NPT(M)	Spray Angle				50 PSI	60 PSI	100 PSI
2"	3/4" (3/4"-Tri-clamp)	3/8"	60°	82	5/16"	1/8"	18	•	•
3" & 4"	3/4" (3/4"-Tri-clamp)	1/2"	60°	120	3/8"	3/16"	•	28	•
6"	1"	3/4"	60°	210	1/2"	3/16"	•	50	•
8" & 10"	1"	1"	60°	340	5/8"	1/4"	•	•	108

V. Customer Connection Requirements

1) These connection requirements are based on a velocity of 8 ± 1.5 FPS (feet per second) and/or with head loss / pressure to the customer connection of 3 ± 1 PSI.

2) Any fittings installed prior to the customer connection (elbows, tees, valves) can add to the head loss / pressure. Increasing the minimum supply line pipe connection size required.

3) The use of various Piping or Tubing material types can add to the head loss / pressure to the spray nozzle assembly. Please contact customer service for any questions specific to your application.

PVC - Sch 80

2" Strainer

0 - 25 ft: 1" pipe
26 - 100 ft: 1-1/2" pipe

3" & 4" Strainers

0 - 100 ft: 1-1/2" pipe

6" Strainer

0 - 25 ft: 1-1/2" pipe
26 - 100 ft: 2" pipe

8" & 10 Strainers

0 - 75 ft: 2-1/2" pipe
76 - 100ft: 3" pipe

TUBING (.065 Wall) (Stainless Steel)

2" Strainer

0 - 100 ft: 1-1/2" tubing

3" & 4" Strainers

0 - 40 ft: 1-1/2" tubing
41 - 100 ft: 2" tubing

6" Strainer

0 - 50 ft: 2" tubing
51 - 100 ft: 2-1/2" tubing

8" & 10 Strainers

0 - 50 ft: 2-1/2" tubing
51 - 100 ft: 3" tubing

Turbo-Disc Filter
Side/Slip-Stream Skid Systems

THE EVOLUTION OF AUTOMATIC FILTRATION

FOR HVAC AND PROCESS COOLING WATER

APPLICATIONS

Automatic turboDisc Filter

Full-Stream

Side-Stream

Slip-Stream

Miller-Leaman's state-of-the-art automatic ***Turbo-Disc Filter*** sets the standard for cooling tower and chilled water filtration. The modular design is available in single-pod and multiple pod models. Systems are engineered with and without pumps, for full-stream, side-stream and slip-stream applications. Using a fraction of the backwash water used by conventional sand filters, the Turbo-Disc is effective in removing particulate (sand, sediment, dirt, scale) and light airborne contaminants (cottonwood seed, algae, etc.), both of which are commonly found in cooling tower water.

Benefits of the Turbo-Disc Filter:

- Improves heat transfer resulting in a reduction in energy costs.
- Cuts maintenance costs dramatically by decreasing downtime for cleaning and repair.
- Complements chemical and/or non-chemical water treatment program, therefore reducing the total cost of water treatment.
- Increases lifespan of downstream equipment such as heat exchangers, chillers and process equipment (i.e. injection-molding machines).

2-Pod Side-Stream System, complete with 150 GPM Pump

16-Pod, 1,600 GPM Full-Stream System, complete with Booster Pump

Turnkey Systems Include:

- Automatic Filters / Disc Cartridges
- Stainless Steel Inlet / Outlet / Backwash Manifolds
- Automatic Backwash Valves / Solenoids
- Miller-Leaman ***Maxim*** Backwash Controller, complete with differential-pressure switch-gauge
- Stainless Steel Frame and Skid Assembly
- Available with or without Pump and/or Booster Pump
- Motor Starter(s)– Single Point Electrical Connection
- Outlet Control Valve (on multiple pod systems only)
- Air-Override Feature (air enhances backwash efficiency)

Optional Equipment:

- Isolation Valves
- Pump Pre-Strainer
- Air compressor (if compressed air is not available)
- Sweeper Piping Eductor Nozzles
- Switching Valves to Filter Multiple Sumps
- Water Disinfection Equipment

10-Pod, 800 GPM Side-Stream System, complete with Main Pump and Booster Pump

MILLER LEAMAN INC

AUTOMATIC FILTER OPERATION

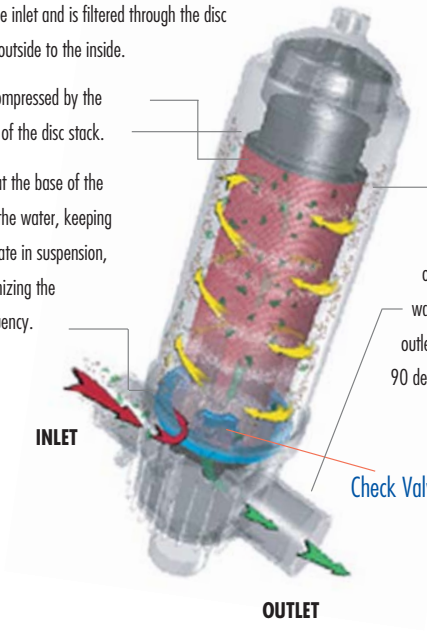
FILTRATION MODE

Water enters the inlet and is filtered through the disc stack from the outside to the inside.

The discs are compressed by the disc cap on top of the disc stack.

The spin plate at the base of the cartridge spins the water, keeping heavier particulate in suspension, therefore minimizing the backwash frequency.

Filtered contaminants collect on the exterior of the discs and throughout the depth of the discs, while filtered water exits through the outlet, either in-line or 90 degrees to the inlet.



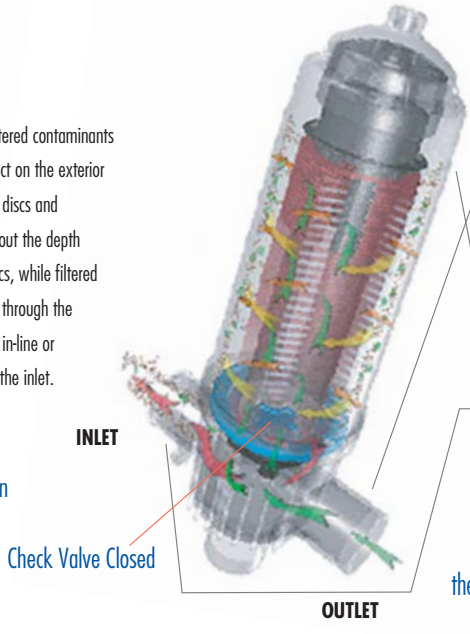
BACKWASH MODE

When the filter cartridge requires automatic cleaning:

Clean filtered water from the outlet manifold (green arrows) flows up through molded spray nozzles (orange arrows and white spray) centrifugally spinning and spraying the discs clean.

Simultaneously, the disc cap lifts hydraulically, decompressing the disc stack.

Dirty water and particulate exit through the filter inlet (red arrows) into the 2" flush manifold, which goes to drain.



When the backwash cycle is complete, the disc cap re-compresses the disc stack and the next filter is sequentially backwashed until the filter system is clean.

TECHNICAL DATA

Flow Rates for a Single Filter Pod*:

Multiple pods are manifolded for higher flow rates.

2"/70 GPM Max. Per Filter Pod
3"/100 GPM Max. Per Filter Pod

* Maximum flow rates vary greatly depending on water quality, solids loading, and micron size of the disc media. **De-rate flow to 50 GPM (per pod) with 50-micron disc media.**

Micron Options Available*:

50-micron (≈250 - mesh)
100-micron (≈150 - mesh)
130-micron (≈120 - mesh)
200-micron (≈ 80 - mesh)

* Centrifugal spinning action of heavy particles combined with the caking-effect achieved across the three-dimensional disc media, greatly increases the micron efficiency.

Pressure Rating:

All Systems Rated Up to 125 PSI

Temperature Rating:

All Systems Rated Up to 140°F

Materials of Construction / Technical Information:

Filter Housings: Polyamide
Filter Disc Media: Polypropylene
Gaskets and O-rings: EPDM
Filter Pod Clamp: Stainless Steel
Inlet / Outlet / Backwash Manifolds; Frame & Skid Assembly:
Type 304 Stainless Steel
Backwash Valves
Bronze (2" filter housings)
Cast Iron, Epoxy-Coated (3" filter housings)
Solenoids: Plastic / Brass

ENGINEERED TO MEET YOUR SPECS

Maxim Backwash Controller Features:
- Backwash based on Differential-Pressure, Elapsed Time or Manually.
- User Adjustment of Critical Control Functions (i.e. backwash duration, differential-pressure setting, etc.)

Flow Pump and / or Booster Pump Electrical:
- 460-volt / 3 Phase (standard) – Single Point Electrical

Outlet Control Valve: Cast Iron, Epoxy-Coated (Multiple pod systems only)
Air-Override Feature: 1/4" NPT connection for compressed air
- Air compressor is optional if compressed air is not available

800 Orange Avenue • Daytona Beach, FL 32114
phone: 386.248.0500 • toll free: 800.881.0320
fax: 386.248.3033 • www.millerleaman.com

MILLER LEAMAN INC

MILLER LEAMAN INC
Pure Filtration Solutions.

QuadGraphics
Innovative People *Redefining* Print

Miller-Leaman's Turbo-Disc Filter a Hit with Customers and the Environment

Daytona Beach, Fla. - Miller-Leaman, Inc., a leader in the field of innovative filtration, has had great success with its Turbo-Disc Filter, a product that sets new standards for cooling towers and chilled water filtration.

But don't just take it from them; listen to their customers.

Kevin Becker works at QuadGraphics, a printing company with locations all across the U.S.

"Their Turbo-Disc filter is far superior to any of the ones we've used in the past," Becker said. "It's been basically trouble-free. We monitor the system but haven't had to touch it all, and it's been a huge component in our success the last few years."

What makes the Turbo-Disc Filter so effective? For one thing, it's highly versatile. It comes in single-pod and multiple pod models, and also can be engineered with and without pumps, for full-stream, side-stream and slip-stream applications.

Second, it's highly efficient at conserving water; the Turbo-Disc Filter uses only a fraction of the backflushing water used by conventional sand filters, and large savings in water consumption and associated chemicals can be realized since no external source is needed to provide backflush water. The filter is also highly effective in removing organic and non-organic particulate along with light airborne contaminants, which are often found in cooling towers.

Another way the filter is good for the environment is it provides a smaller installation carbon footprint, which helps lead to lower installation costs. The Turbo-Disc Filter also improves heat transfer, resulting in a reduction in energy costs, and as Becker said, it cuts maintenance costs dramatically by decreasing downtime for cleaning and repair. There are no filters to replace or nor parts to change out, making the Turbo-Disc Filter a very attractive option for companies.

Miller-Leaman has been around since 1991, and at its 52,000 square foot headquarters in Daytona Beach, Fla. Miller-Leaman manufactures many standard and custom design filtration products.

For more info on the Turbo-Disc Filter, or on any Miller-Leaman product, contact the company at 1-800-881-0320, e-mail them at sales@millerleaman.com, and visit their website at www.millerleaman.com.

Cooling Tower Case Study

Georgia College & State University • Milledgeville, Georgia

"Automatic Disc Filter Keeps University's Cooling Water Clean"

An often overlooked aspect of cooling water systems is adequate filtration. An increasing number of cooling tower users are installing automatic filtration systems to remove particulate and control contamination levels. At Georgia College & State University in Milledgeville, Georgia, automatic, self-cleaning disc filters have provided an efficient and cost-effective solution to maintaining cleanliness and optimum performance of their cooling towers.

Georgia College & State University

Cooling towers, by their nature, are excellent air scrubbers. The cascading water washes airborne particles into the tower basin. These particles collect in the system and cause an array of problems with downstream equipment and the tower itself. Reduced cooling efficiency, shortened equipment life, increased maintenance and frequent downtime all can result from high concentrations of particulate. In addition, particles provide a "breeding ground" for algae and biological growth. Effective control of contaminants can enhance chemical water treatment and reduce costs by limiting "sites" for organic growth.

Kevin Murner, Associate Director of Operations and Maintenance, evaluated several filtration options for a new, three-cell cooling tower at the college. An automatic *Turbo-Disc Filter* system, manufactured by Miller Leaman, Inc., was chosen based on prior experience with a smaller *Turbo-Disc Filter* system. The smaller *Turbo-Disc Filter* system performed well and provided effective, automatic filtration with minimal maintenance and operating costs.

The 10-pod automatic *Turbo-Disc Filter* is installed on a side-stream loop and pulls dirty water from the tower basin at a rate of 1,000 GPM and returns the clean, filtered water back into the basin. Side-stream filtration results in the entire system volume being circulated through the filter multiple times per day. The system is comprised of multiple "pods" of disc filters, stainless steel manifolds and piping, a circulation pump for system flow, and controls for automatic operation.

Turbo-Disc System Installation on the GA College Cooling Tower

The filter pod utilizes a stack of polypropylene discs with grooves molded into each disc's surface. When stacked, the grooves overlap in a "cross hatching" effect, therefore creating a tortuous path through which the dirty water must flow. Particles are trapped by the discs and accumulate until the filter requires backwashing. Disc filtration technology was developed decades ago *(continued on page 2)*

(continued from page 1)

and was originally used to filter fine metal particles from hydraulic fluid on aircraft.

When the filter requires backflushing, the flow direction is reversed through each filter pod sequentially. A small amount of compressed air is used to evacuate the vessel and flush the dirty water from the pod. Clean, filtered water is then sprayed from multiple nozzles located in four spray bars, spinning and scouring the discs clean. Each pod takes just 20-30 seconds to backflush with as little as 8 to 10 gallons of water (per pod).

1,000 GPM Turbo-Disc Filter Side-Stream Skid System

The extremely low volume of water required for backflushing is a significant advantage over other types of filters, such as sand media filters, which are conventionally used in this application. Significant savings in water consumption and associated chemicals can be realized. In addition, a smaller installation footprint, easier maintenance and user-friendly controls made the *Turbo-Disc Filter* system a very cost-effective choice.

The original filter installed at the college was a single-pod air-assist automatic *Turbo-Disc Filter* rated at 70 GPM. The filter has been in service for several years.

Cooling Tower Case Study

Miller-Leaman Turbo-Disc Filter vs. Sand Filters

When evaluating sand filters vs. Miller-Leaman Turbo-Disc filters, please consider the following important points:

Back-flush Water Consumption

- Sand filters, by design, have a large amount of surface area and depth. This provides for good filtration performance, but requires a tremendous amount of back-flush water. In order to accomplish effective back-flushing, the entire sand bed must be "fluidized" or lifted and mixed thoroughly to clean the collected contaminants from the sand. This requires a large volume of water for an extended period of time.

- Sand filters typically back-flush at the rated full flow for approximately 3 to 8 minutes. For example, a sand filter rated for a flow of 300 gpm will consume 300 gallons per minute for 3 to 8 minutes. ***This means the sand filter will use as much as 900 - 2400 gallons of water per back-flush!***

- This high volume of water can have costly and complex consequences:

    - If chemical treatment is used, costly chemicals are being flushed down the drain with each back-flush.

    - Some installations using floor drains cannot accommodate the back-flush volume and often require a "holding tank" to store back-flush water until it is slowly drained.

    - If sewer charges are applicable, this added cost for the back-flush water must be considered.

- Our Turbo-Disc filter back-flushes at a rate of 45 gpm per pod for 15 to 20 seconds***. A 3-pod Turbo-Disc system (300 gpm) would use only 30 – 45 gallons of water per back-flush!*** Compare that to the sand filter discussed above. Assuming one back-flush every 8 hours, ***this could result in an annual water savings of over 1 million gallons!***

- ***The patented Turbo-Disc design makes this possible:***

    - The inlet turbo blades create a "spinning" action during filtration mode, which causes the water to spiral around the disc stack. Centrifugal force slings the heavier particles away from the filtration discs. This prevents the larger particles from plugging the discs and extends the interval between back-flushes.

    - At the start of back-flush, our air override feature uses compressed air to rapidly evacuate the filter pod prior to back-flush. The resulting empty chamber allows for a more aggressive, high velocity back-flush as the discs are violently scrubbed with high pressure, filtered water.

    - During back-flush, the disc cap, which compresses the disc stack during filtration mode, lifts; decompressing the discs. The back-flush spray nozzles, molded into the frame which supports the disc stack, spray high pressure, filtered water uniformly across and between the discs. The nozzles are also oriented to spray water in a tangential direction across the discs. This causes the discs to spin rapidly during back-flush, improving the efficiency of the back-flush.

- The grooves molded into each disc are tapered toward the inside diameter of the disc. This means the space between grooves grows smaller from the outside diameter towards the inside diameter of the disc (in the direction of filtration flow). During filtration, particles are trapped in these grooves throughout the depth of the filter. During back-flush, the spinning action of the discs in combination with the water spray releases the particles from the disc stack and flushes them out to drain.

- When the back-flush cycle is complete (typically 15-20 seconds), the disc cap compresses the disc stack and normal filtration is resumed.

- In addition, our proprietary Maxim controller offers the flexibility to adjust and control the back-flush cycle to optimize performance and minimize water consumption. Back-flush is initiated by a timed interval or pressure differential across the filter (whichever comes first). By adjusting these settings, as well as the length of back-flush, filter operation can be matched to the specific conditions of the application, optimizing filter performance and minimizing back-flush water consumption.

Filtration Performance

- Sand filters, due to the large volume of media (sand), have high surface area and a great deal of depth for filtration. This can provide for filtration of particles down to 10 microns in size. However, this level of filtration comes at a significant cost when considering the entire scope of the application. Back-flush water requirements, maintenance, installation footprint, and drainage issues can negate any gains in filter performance.

- Our Turbo-Disc filter, like the sand filter, is a three dimensional, "depth" type filter. This means that as particulate accumulates during filtration mode, a "caking" effect takes place across the disc stack. ***This "caking" effect results in filtration of very small particles and ultimately, filtration levels approaching that of a sand filter.***

- The discs used in our system are available in several micron ratings (200, 130, 100 and 50 microns). Although these ratings reflect the effective "pore size" within the disc stack, it can be somewhat misleading when considering actual filter performance. The three dimensional nature of this filter and the "caking effect" described above result in filtration levels well below the stated micron rating of the discs. A water test we conducted at an installation provided results showing that the average particle size downstream of a Turbo-Disc Filter with 50 micron discs was less than 8 microns!

Maintenance

- Proper maintenance of a sand filter includes replacing the sand media periodically. This requires adequate space for draining, removing and replacing the sand. This can be a labor intensive, time consuming, and nasty job.

- ***Our Turbo-Disc filter is designed to be maintained with no special tools***. In fact, you can inspect and replace the disc stack and o-rings by hand in just a few minutes. With proper operation, the Turbo-Disc should require only annual or bi-annual inspection and/or replacement of a few o-rings.

- The polypropylene discs are suitable for organic and non-organic contaminants and should last indefinitely. Filter pods are constructed of polyamide (plastic) and manifolds, piping and support skid are all stainless steel for long service life and corrosion resistance.

Installation / Footprint

- Due to the large volume of sand, the typical sand filter utilizes a large, spherical vessel containing flow distribution piping, back-flush piping, and supports for the media bed. With the associated valves and piping included, ***the footprint for a sand filter is much larger than an equivalently sized Turbo-Disc system***. This can become a significant issue for mechanical room or rooftop installations.

- Overall dimensions for a 3-pod Turbo-Disc system (300 gpm) are 38" W X 52 1/4" L X 70 5/8" H

- Our systems are also constructed with v-band clamps for the filter pods and Victaulic couplings on piping and manifolds. The system can be easily disassembled and re-assembled if required for installation in restricted space locations.

- Our skids are self-contained, "turn-key" systems and only require inlet and outlet water connections and single point electrical connection to our controller.

Summary

- The entire scope of the application should be considered when evaluating side-stream filtration of cooling tower water. The challenge is to balance effective removal of solid contaminants, minimize operating costs (back-flush water consumption), reduce maintenance, simplify installation and ensure automatic, trouble-free operation.

- The "open loop" nature of a cooling tower results in a dynamic filtration challenge where the contamination levels are continuously changing due to many factors. Location, seasonal changes, hours of operation, environmental conditions and many other factors influence the type and quantity of contaminants that will be found in the water.

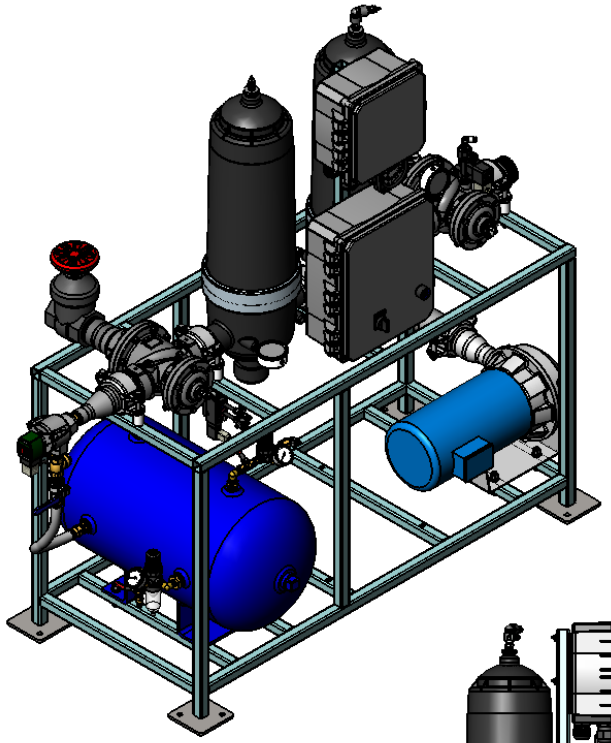
- Filtration of cooling tower water is essentially an exercise of *"controlling"* contamination levels to ensure proper operation of system components and prevent unnecessary maintenance and repairs. This does not mean *"elimination"* of all contaminants, but rather an *"optimization"* of contamination levels to ensure proper operation with minimum cost.

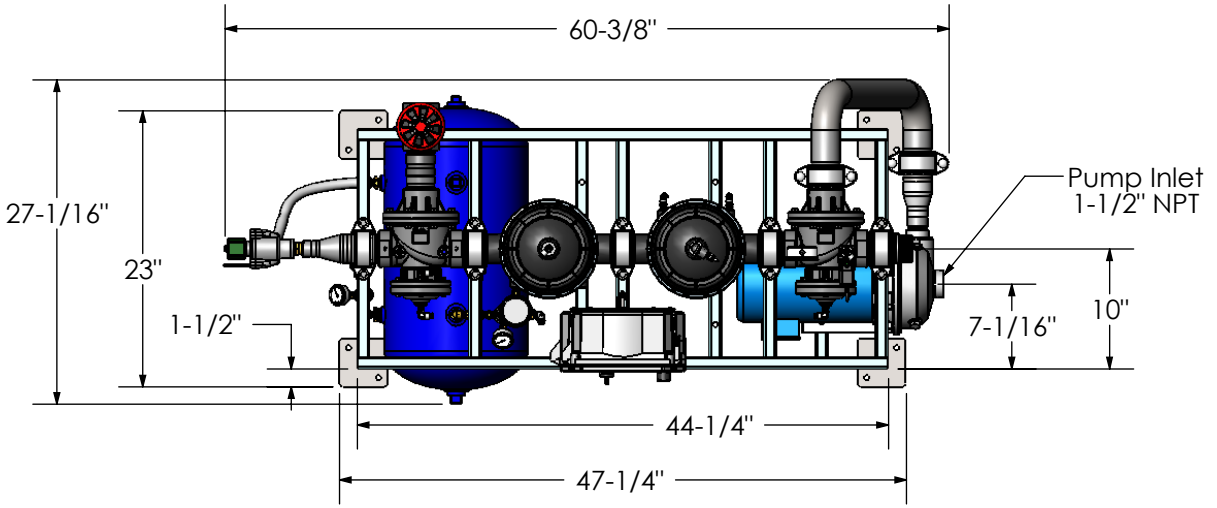
- We believe the Miller-Leaman Turbo-Disc filter offers the best solution for cooling tower water filtration. The Turbo-Disc provides the following benefits resulting in efficient, cost effective and trouble-free operation:

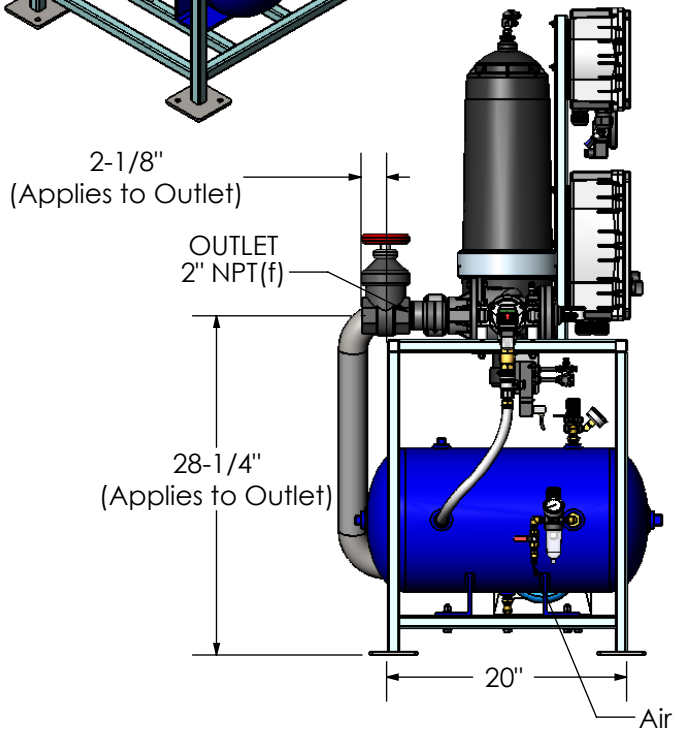
    - Automatic operation
    - Lowest back-flush water consumption
    - Easy operation and maintenance
    - Small installation footprint
    - Quality construction with superior materials

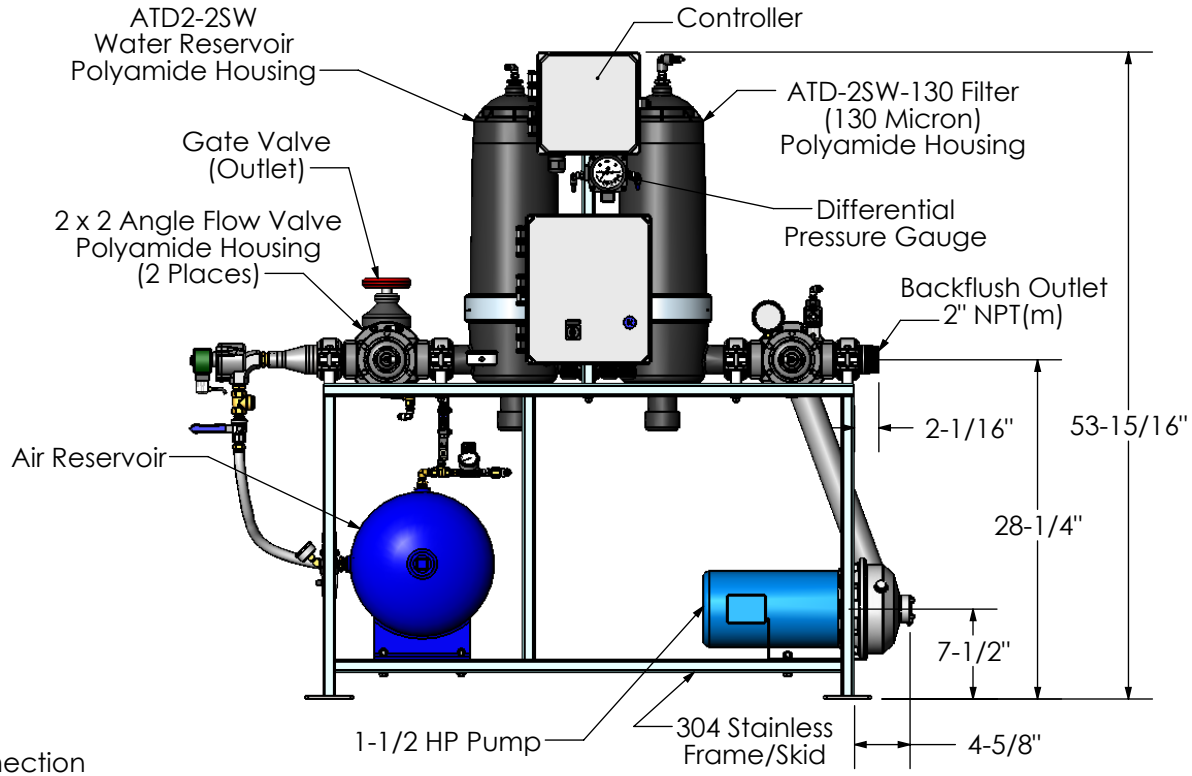
When evaluating the choices for cooling tower water filtration, consider Miller Leaman …

"Pure Filtration Solutions"







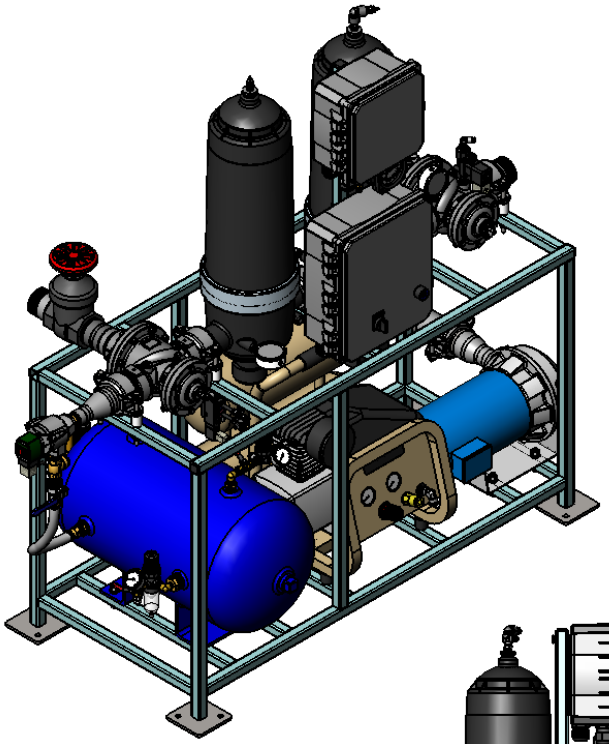


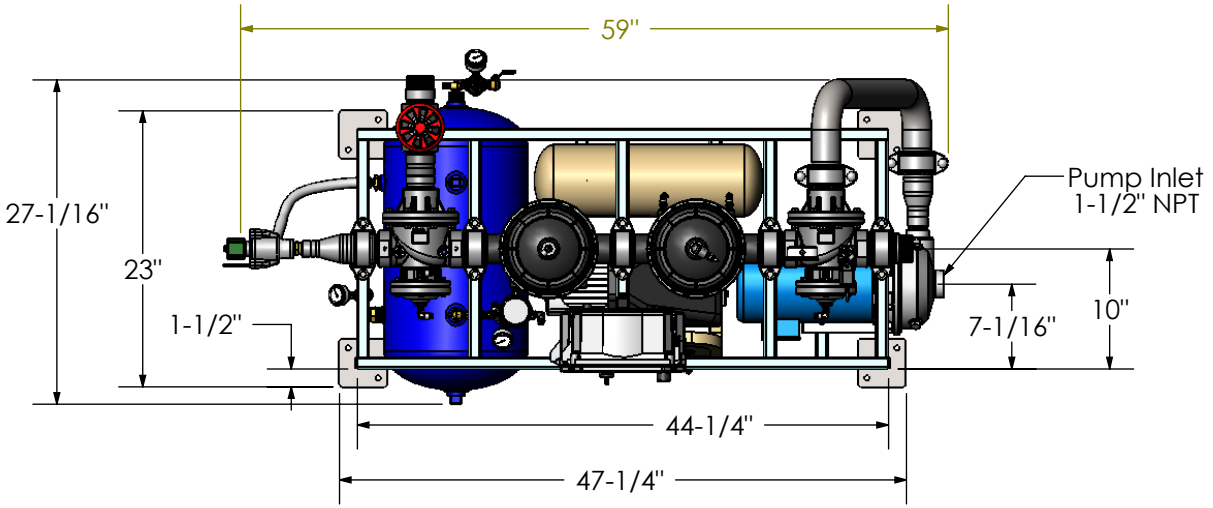
PRODUCT SPECIFICATION	DRAWN	J. Larsen	4/29/10
MILLER LEAMAN INC	CHECKED		
800 Orange Ave. Daytona Beach FL 32114	ENG APPR.		
	MKT APPR.		
	MLI File # ML21117-02 Rev A		SHEET 1 OF 1

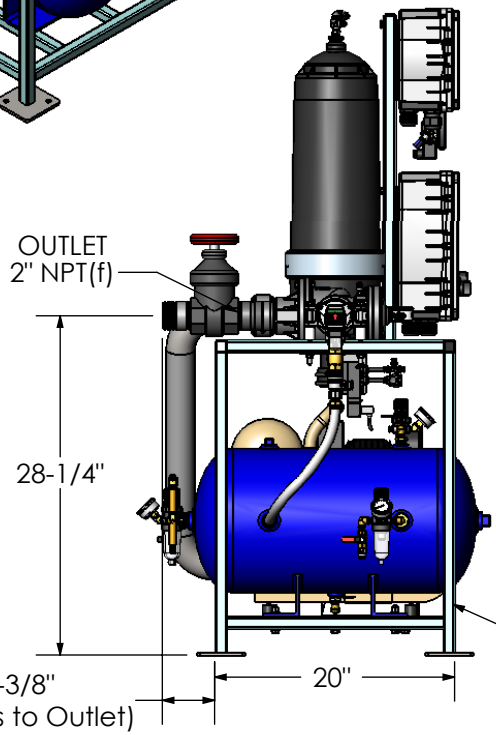
SYSTEM REQUIREMENTS:
Electrical: 460VAC/60HZ/3Ph/4A
Air Supply: 3CFM @ 100-120 PSI
Water Supply @ Inlet: 25 PSi Max
Dry Weight: 206 lbs

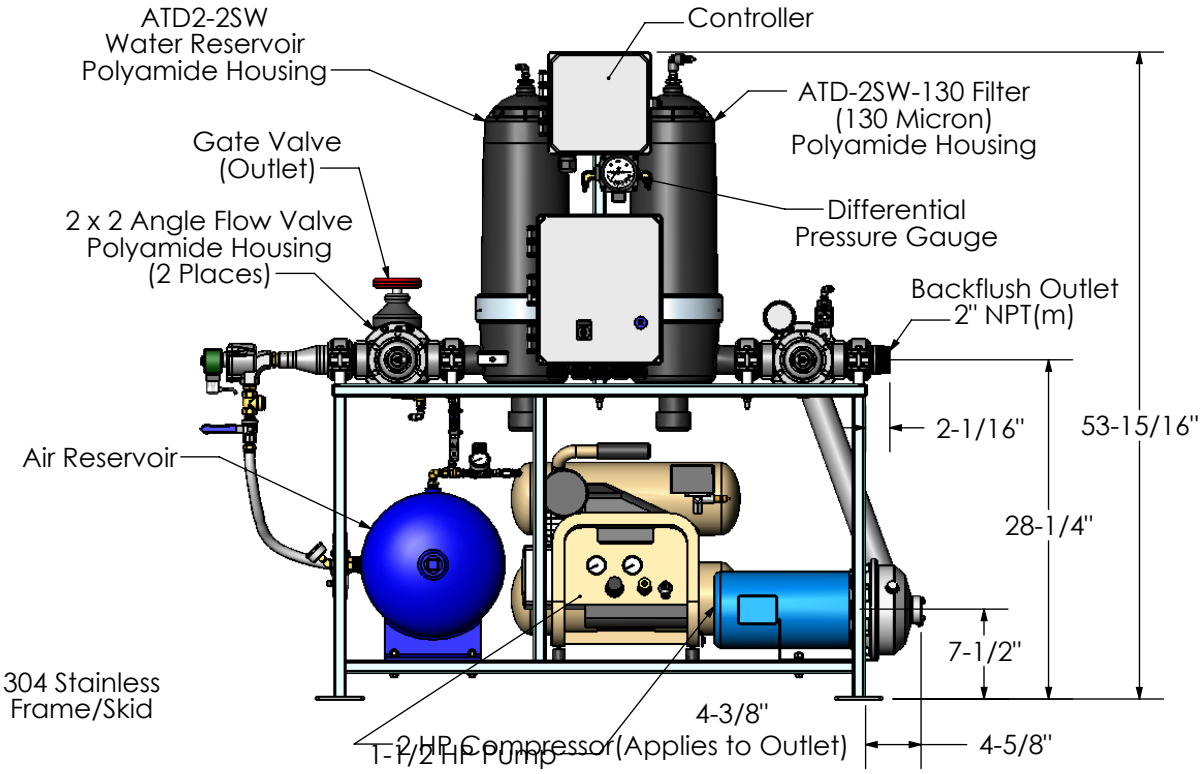
TITLE:

SINGLE POD AIR-ASSIST
Turbo-Disc Filter System
AA-ATD2(1)x2-130M-P70-A









SYSTEM REQUIREMENTS
Electrical: 460VAC/60Hz/3 Ph/4A
Compressor: 115VAC/60Hz/15A
Water Supply: 25 PSI Max.

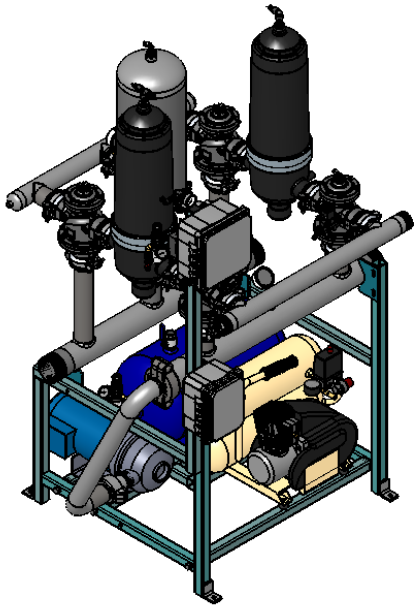
PRODUCT SPECIFICATION

MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

DRAWN	J. Larsen	12/27/10
CHECKED		
ENG APPR.		
MKT APPR.		

SHEET 1 OF 1

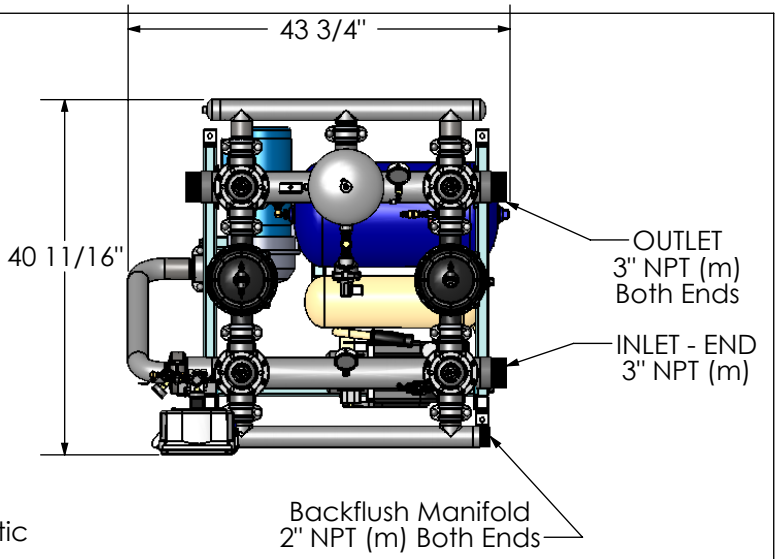
TITLE
Single Pod Air-Assist
Turbo-Disc Filter System
AA-ATD2(1)x2-130M-P70-AC

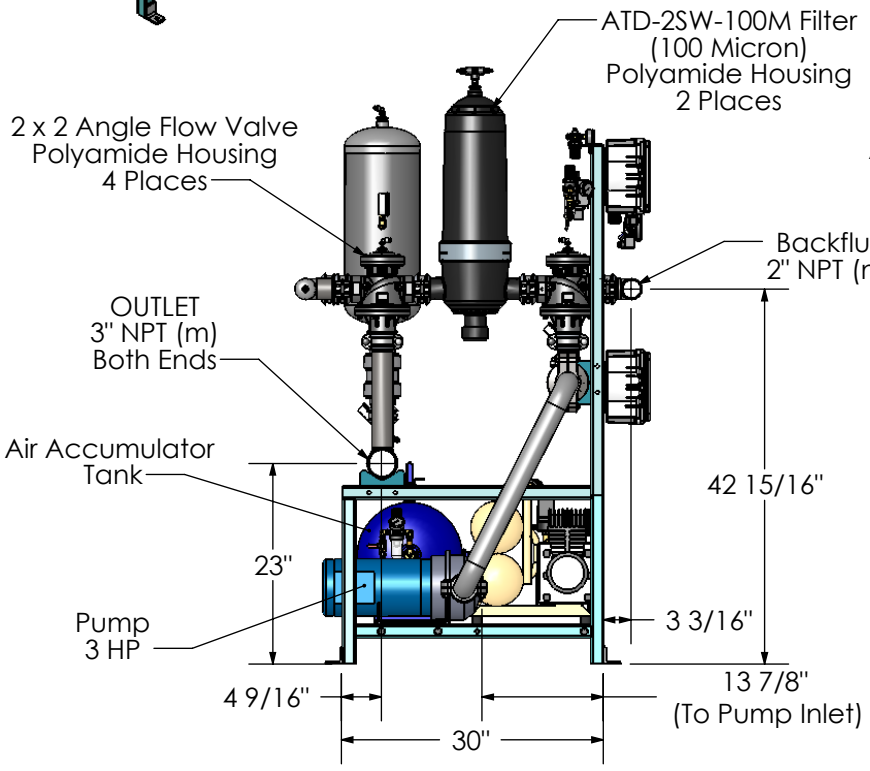


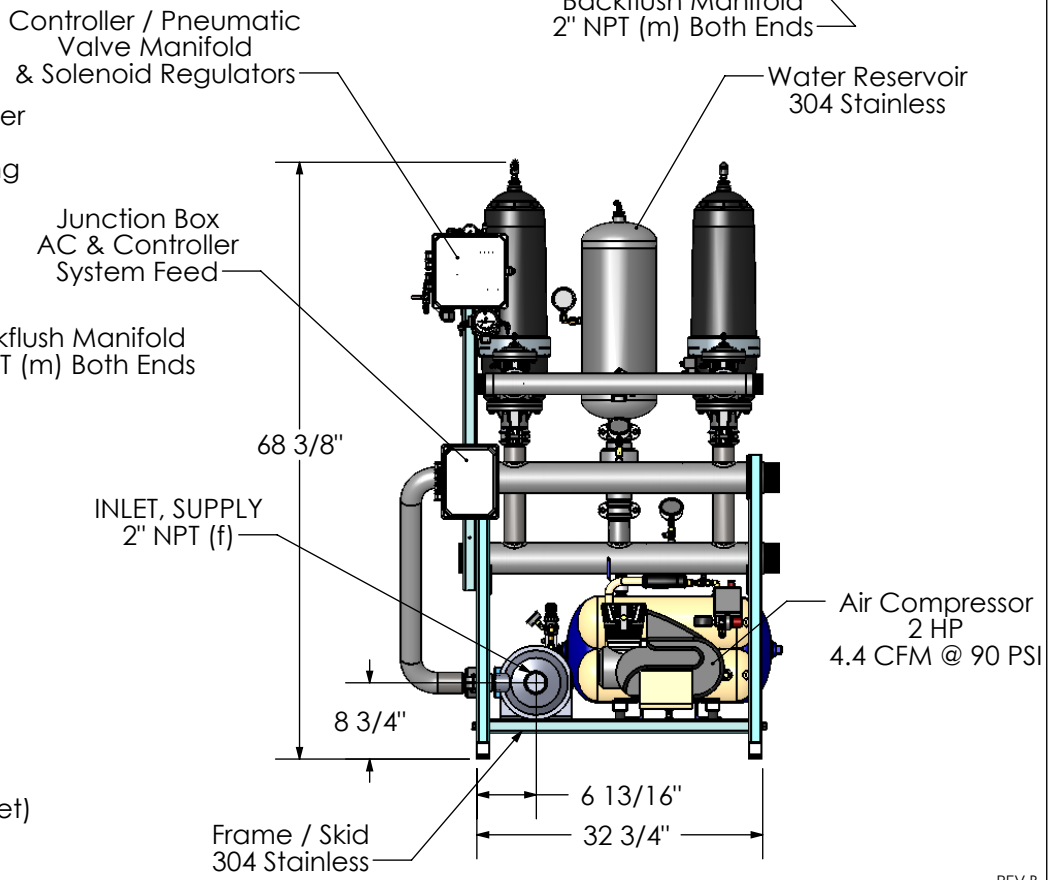
SYSTEM REQUIREMENTS

Electrical Controller & Compressor:
120VAC/1 Phase/60Hz / 16A
Electrical, Pump Motor:
460VAC / 3 Phase / 60 Hz / 5A
Flow Range: 0 to 120 GPM
Max Pressure @ Inlet: 50 PSI

Note:
Customer to supply:
Pump Motor starter
Overload relay
System throttling valve

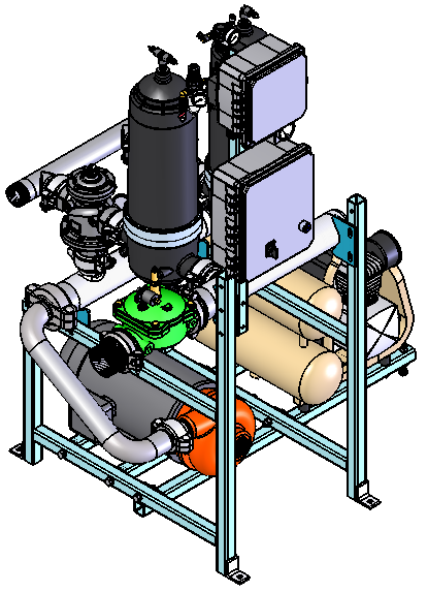


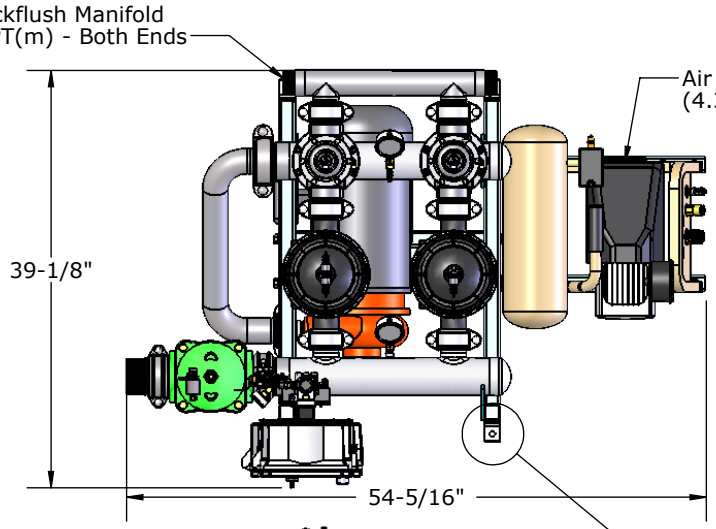


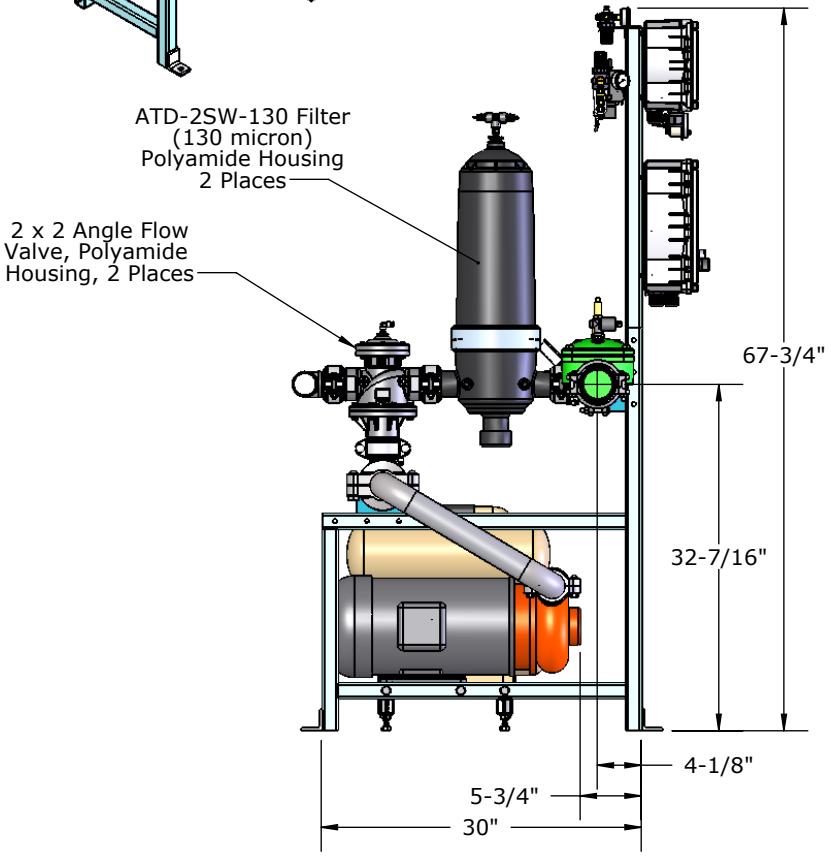


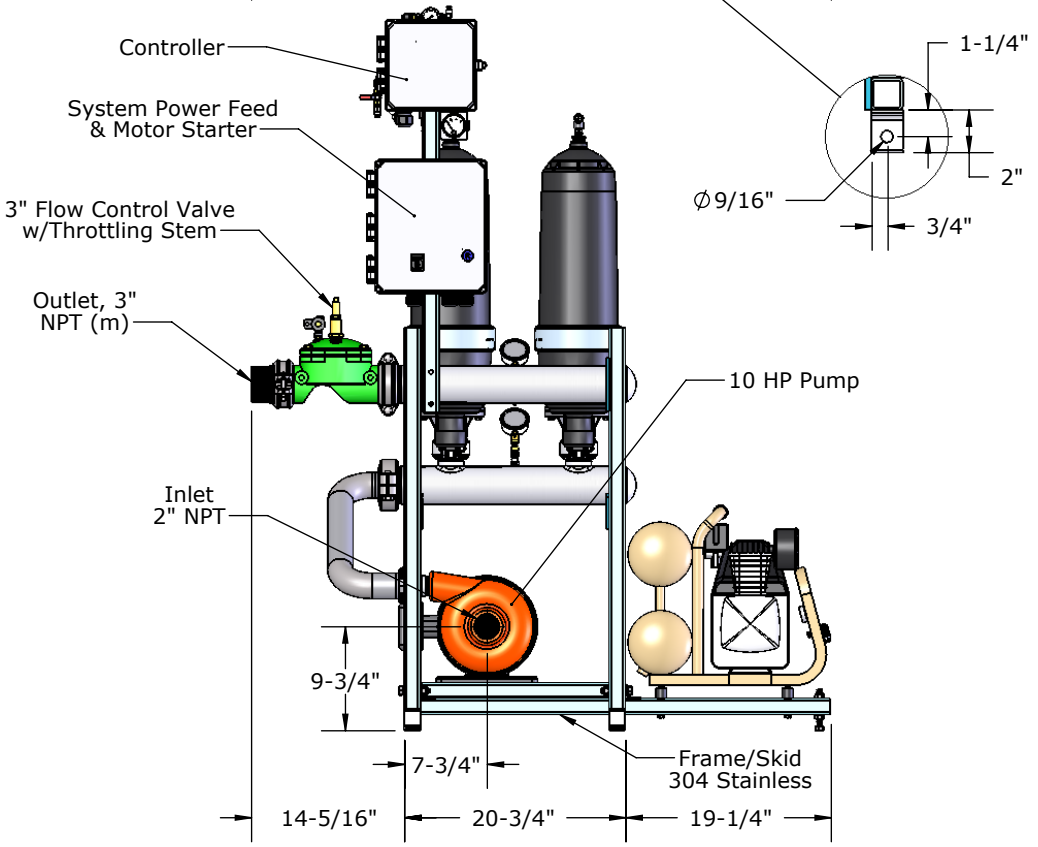
REV B

PRODUCT SPECIFICATION	DRAWN	L.Brannan	11/25/09	TITLE: 2 Pod Air-Assist Automatic Turbo-Disc Filter Skid System
	CHECKED			
MILLER-LEAMAN INC.	ENG APPR.			AA-ATD2(2)x3-100M-P120-AC-MOD1
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			









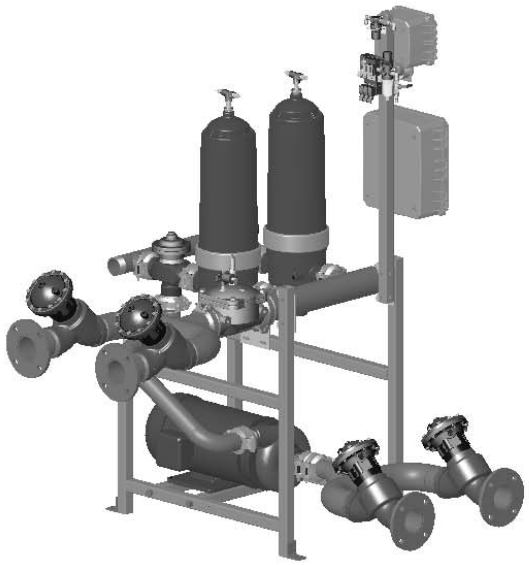
SYSTEM REQUIREMENTS
Electrical: 460VAC/60Hz/3Phase/14A
Compressor: 115VAC/60Hz/1Phase/14.5A
Water Pressure @ Pump Inlet: 0-25 PSI
Dry Weight: 470 lbs

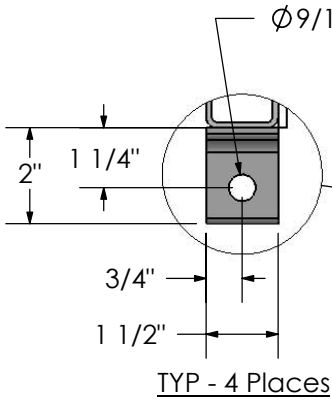
PRODUCT SPECIFICATION

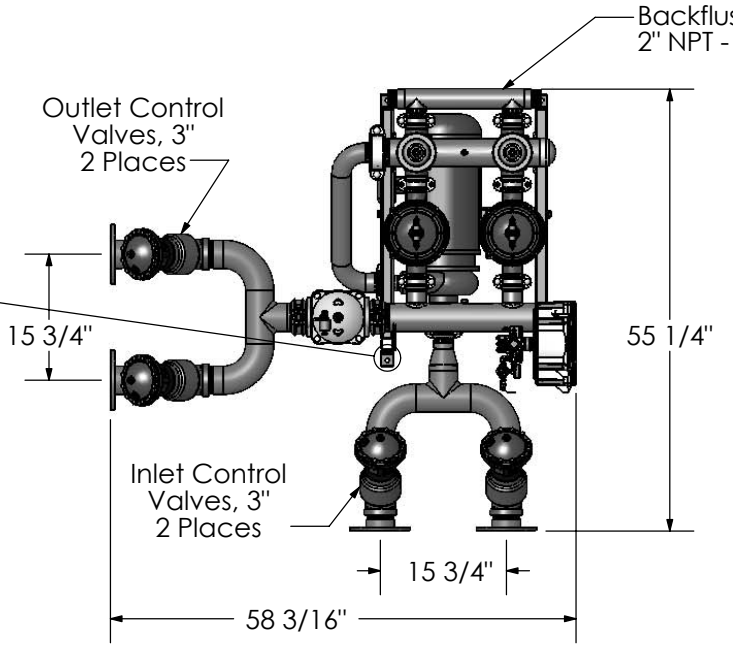
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

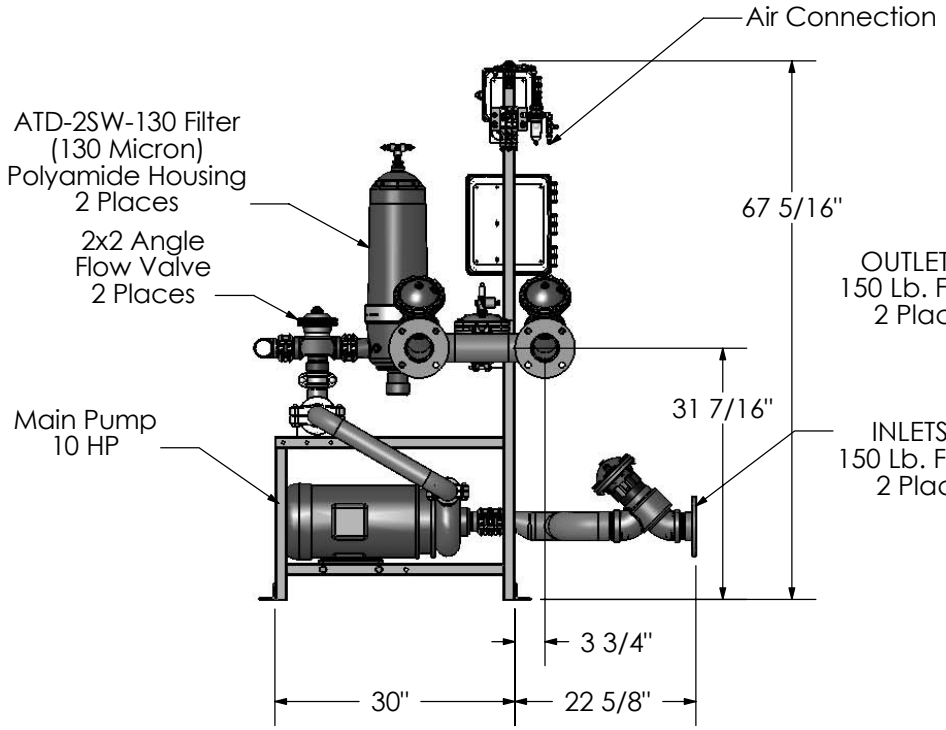
DRAWN	L.Brannan	4/1/09
CHECKED		
ENG APPR.		
MKT APPR.		
SHEET 1 OF 1		Revision C

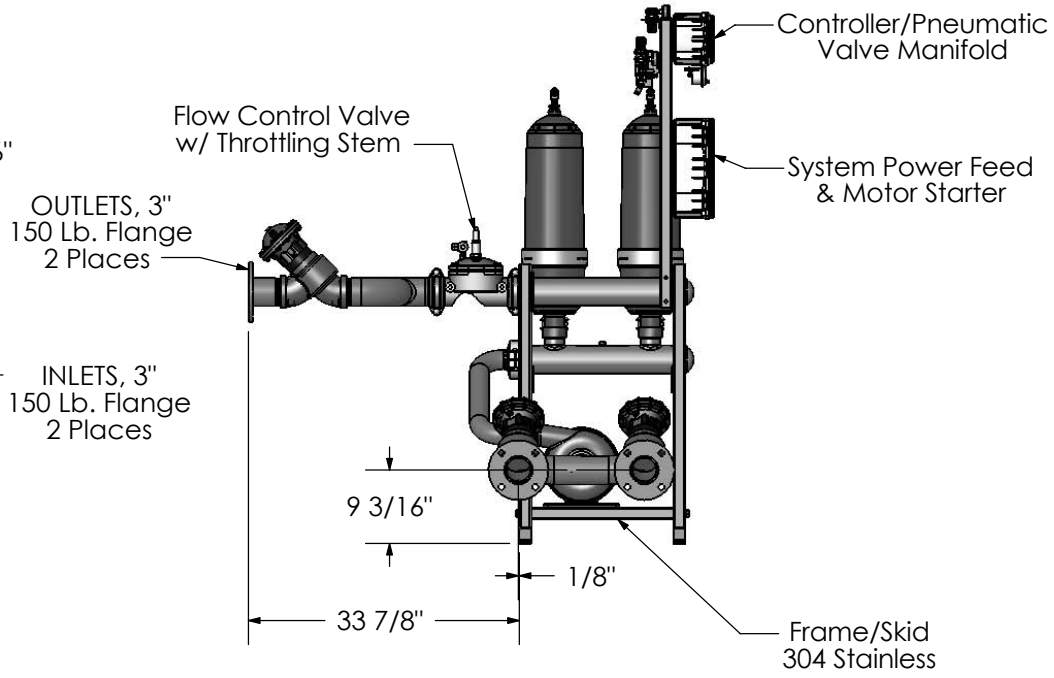
TITLE
Automatic Turbo-Disc
Filter Skid System
ATD2(2)x3-130M-P150-S3-AC











SYSTEM REQUIREMENTS

Electrical: 460VAC/60 Hz/3 Phase/14A
Air Line: 2 CFM @ 80-100 PSI
Water Pressure: 25 PSI Max.

Rev. A

PRODUCT SPECIFICATION

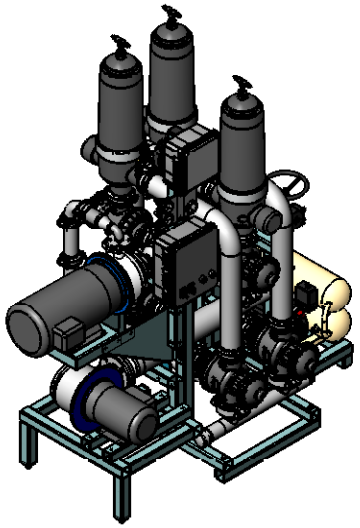
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

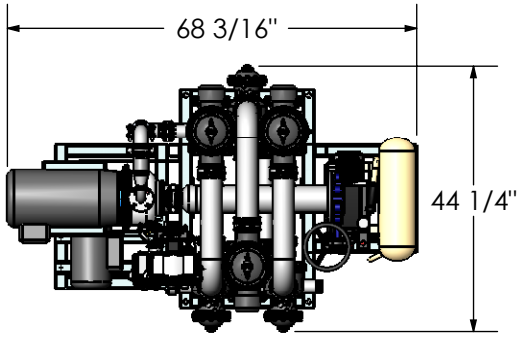
DRAWN	J. Larsen	8/9/05
CHECKED		
ENG APPR.		
MKT APPR.		

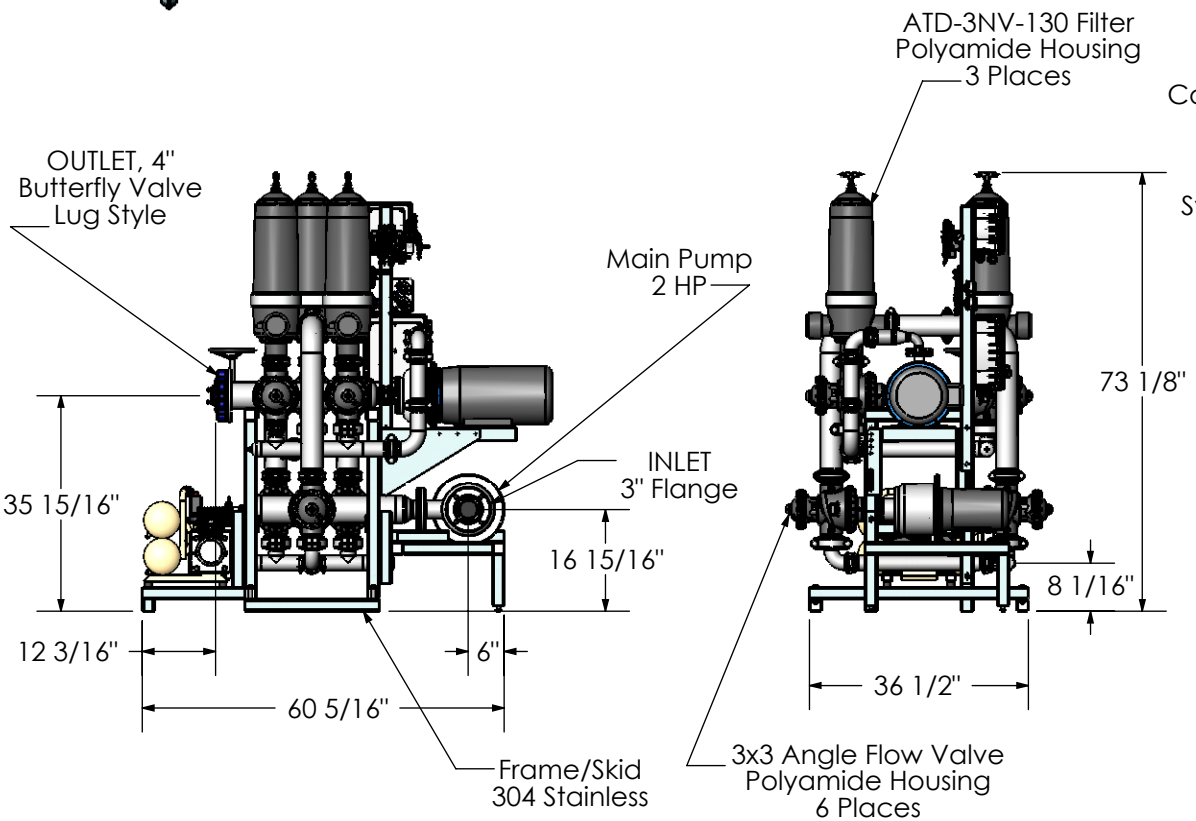
SHEET 1 OF 1

TITLE

Automatic Turbo-Disc
Filter Skid System
ATD2(2)x3-130M-P150-S3-A-MOD2







SYSTEM REQUIREMENTS

Electrical: 575VAC/3 Phase/60Hz/12A
Compressor: 115VAC/1Ph/60Hz/14.5A
Water SupplyPressure At Pump Inlet:
9 PSI Max.

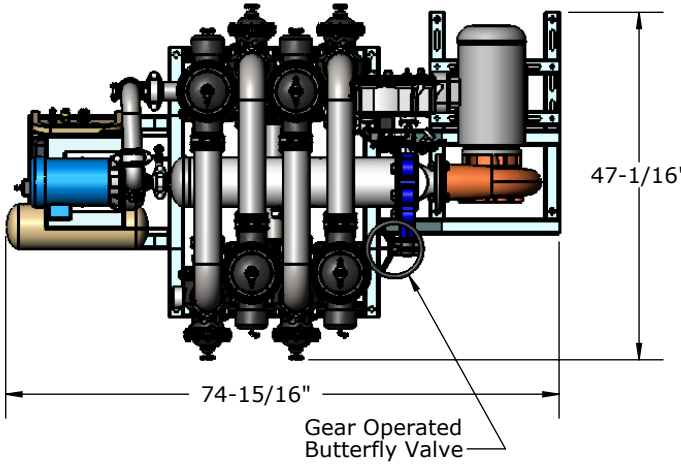
PRODUCT SPECIFICATION

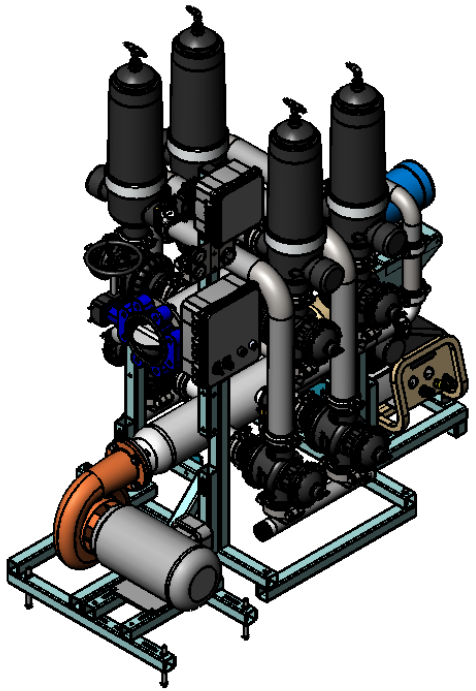
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

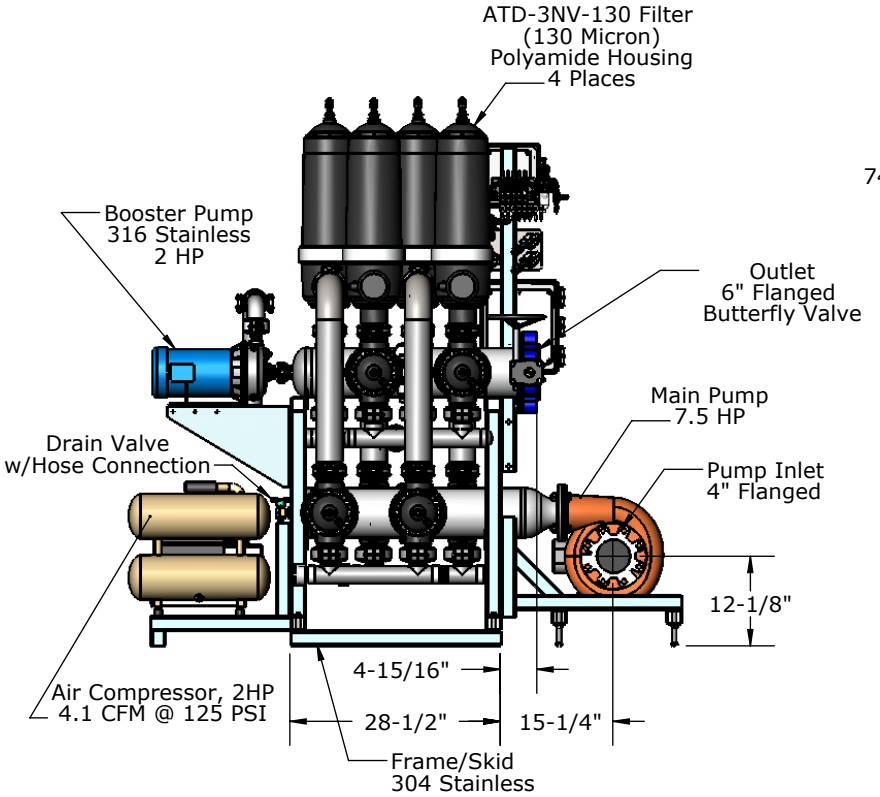
DRAWN	J. Larsen	5/15/09
CHECKED		
ENG APPR.		
MKT APPR.		

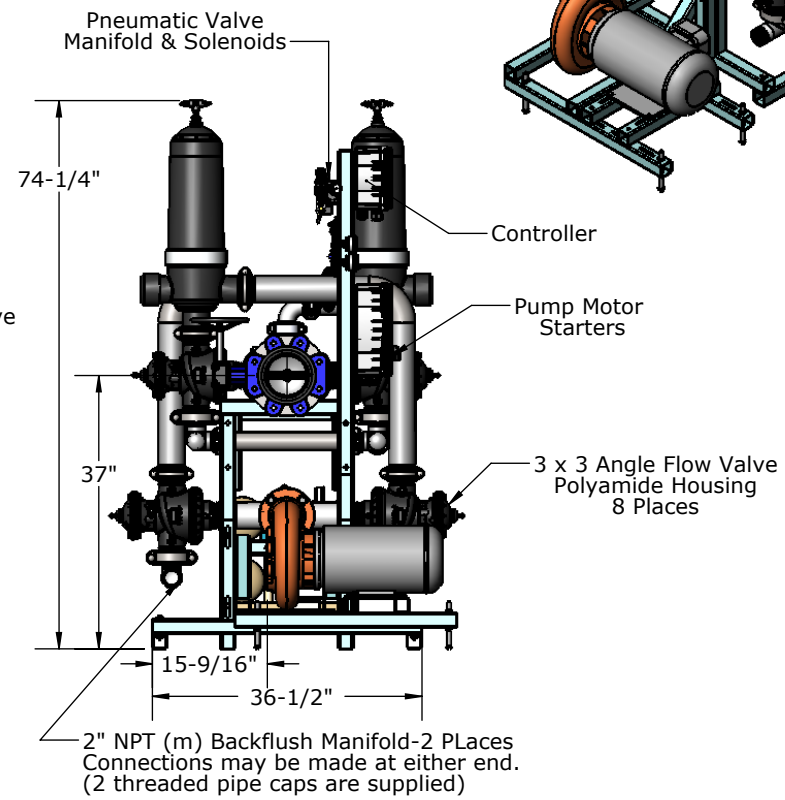
SHEET 1 OF 1

TITLE
Automatic Turbo-Disc
Filter Skid System
B1H-ATD3(3)x4-130M-P200-AC-MOD1









SYSTEM REQUIREMENTS
Electrical:460VAC/3 Phase/60Hz/14A
Compressor:115VAC/1 Phase/60Hz/15A
Water Supply Pressure: 10-25 PSI
Dry Weight: 1250 lbs.

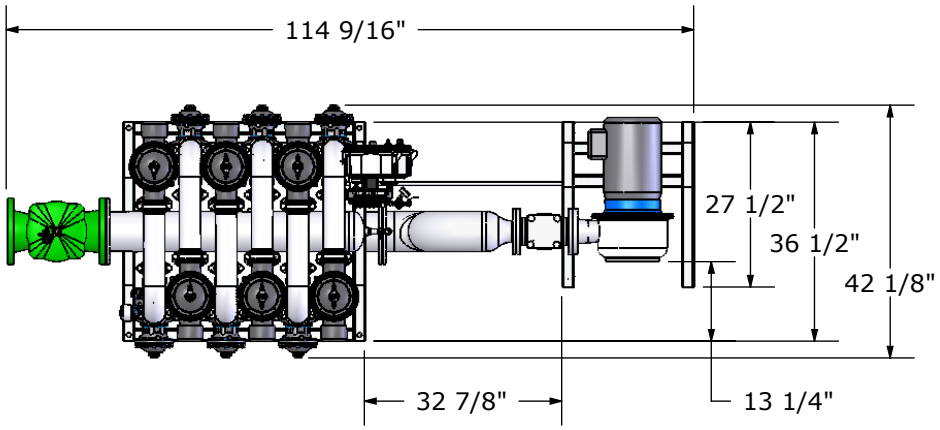
PRODUCT SPECIFICATION

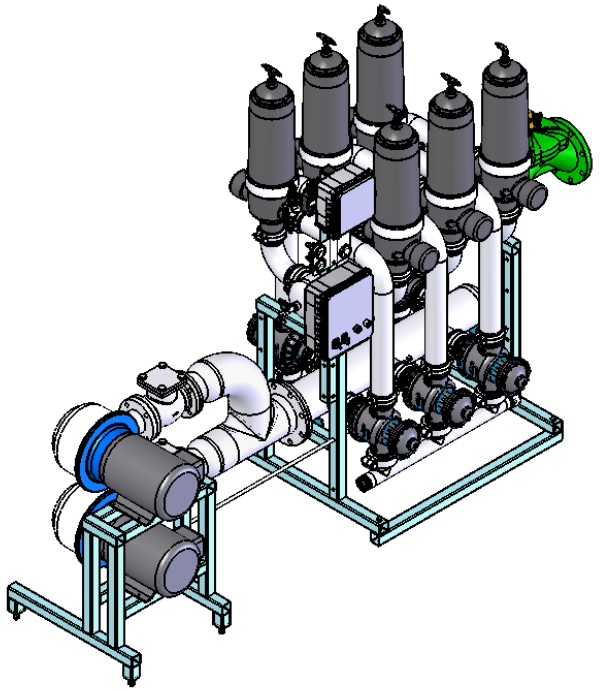
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

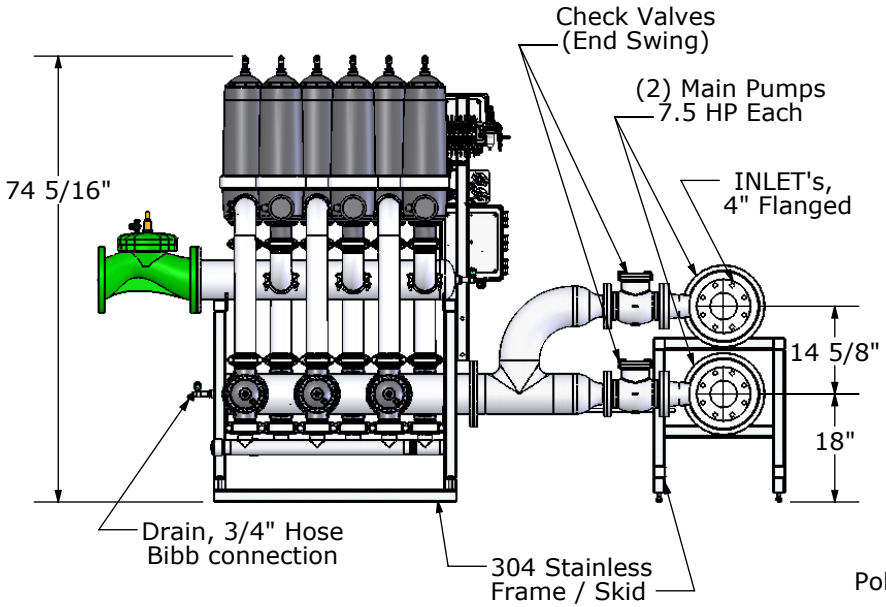
DRAWN	J. Larsen	12/13/10
CHECKED		
ENG APPR.		
MKT APPR.		

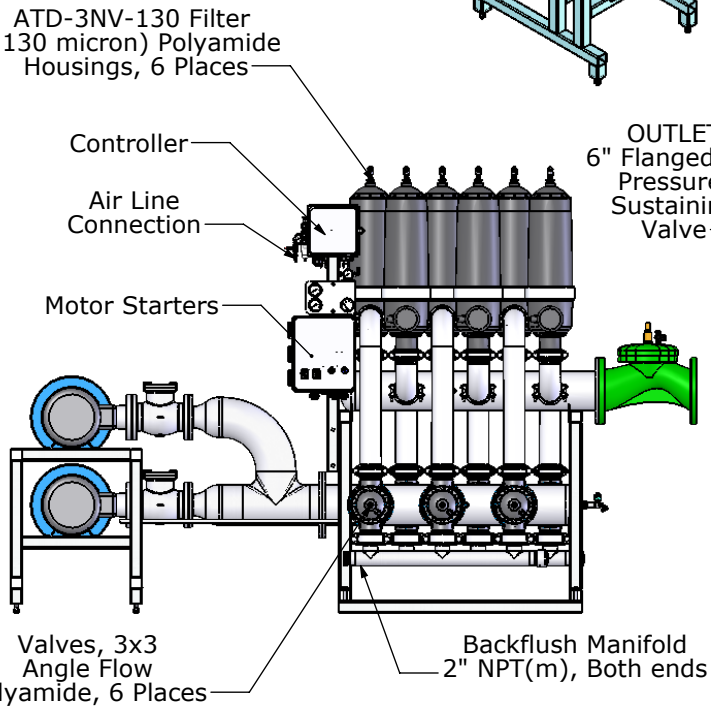
SHEET 1 OF 1

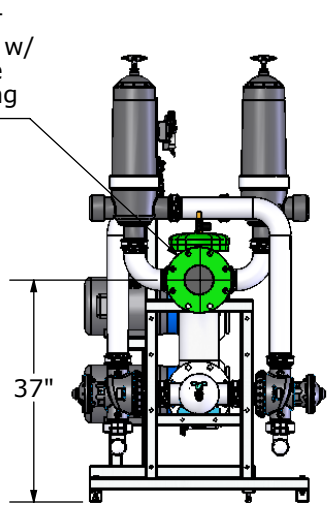
TITLE
Automatic Turbo-Disc
Filter Skid System
B1-ATD3(4)x6-130M-P400-AC-MOD3











SYSTEM REQUIREMENTS
Electrical: 460VAC/3 Phase/60 Hz/11Amps
Air Line: 2 CFM @ 80-100 PSI
Supply Water: 50 to 70 PSI

Dry Weight: 1200 Pds

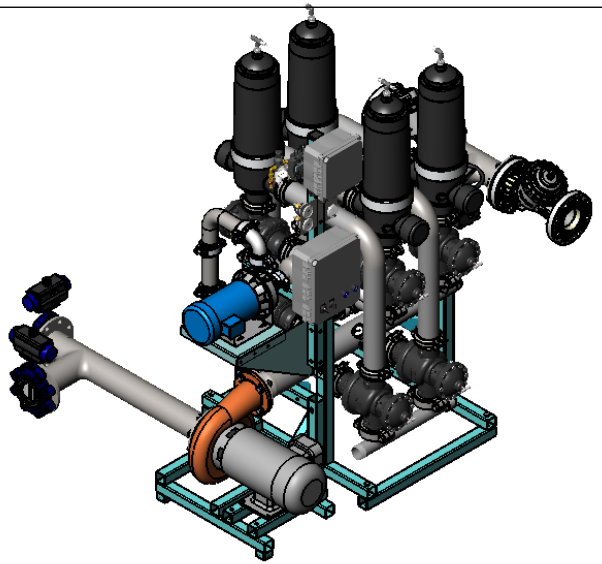
PRODUCT SPECIFICATION

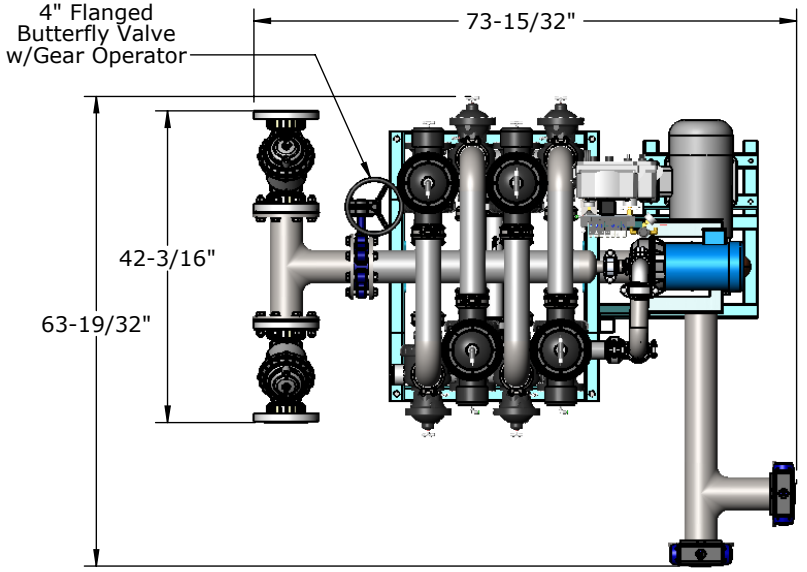
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

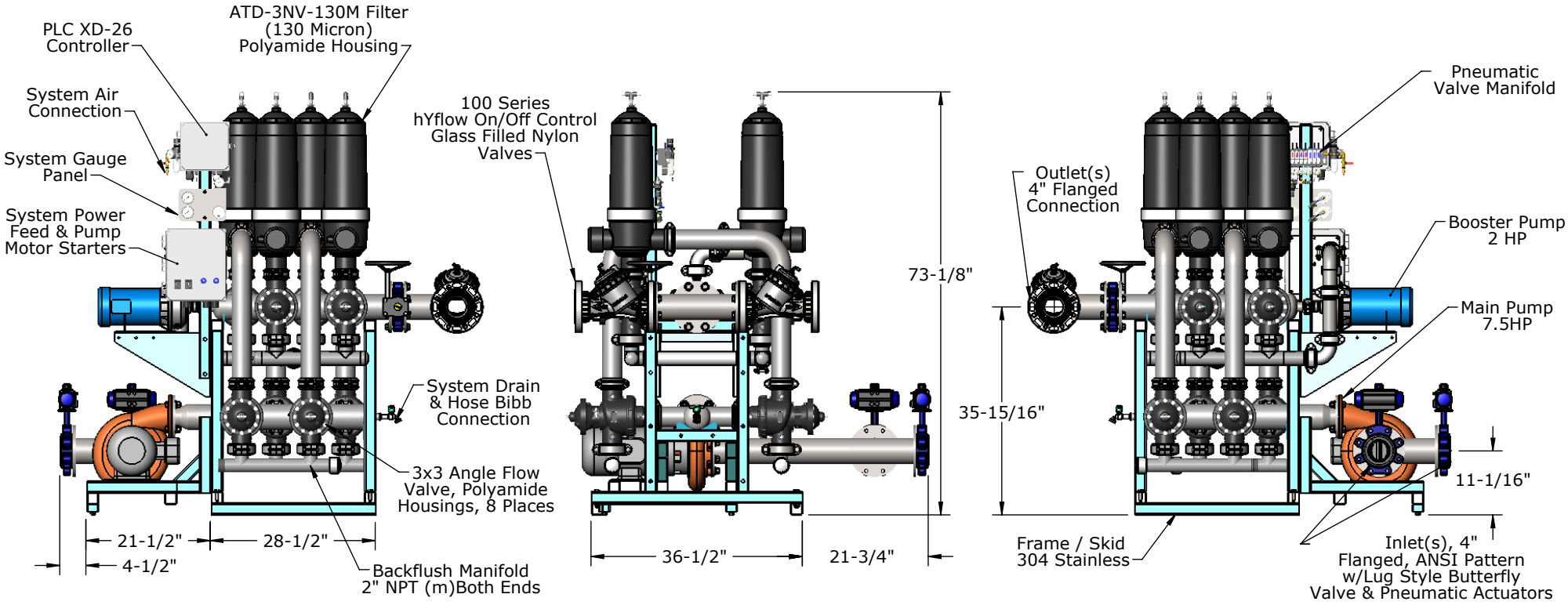
DRAWN	L.Brannan	4/23/09
CHECKED		
ENG APPR.		
MKT APPR.		

SHEET 1 OF 1

TITLE
Automatic Turbo-Disc
Filter Skid System
ATD3(6)x6-130M-P500-S6-A-MOD3







PRODUCT SPECIFICATION

MILLER LEAMAN INC
800 Orange Ave. Daytona Beach FL 32114

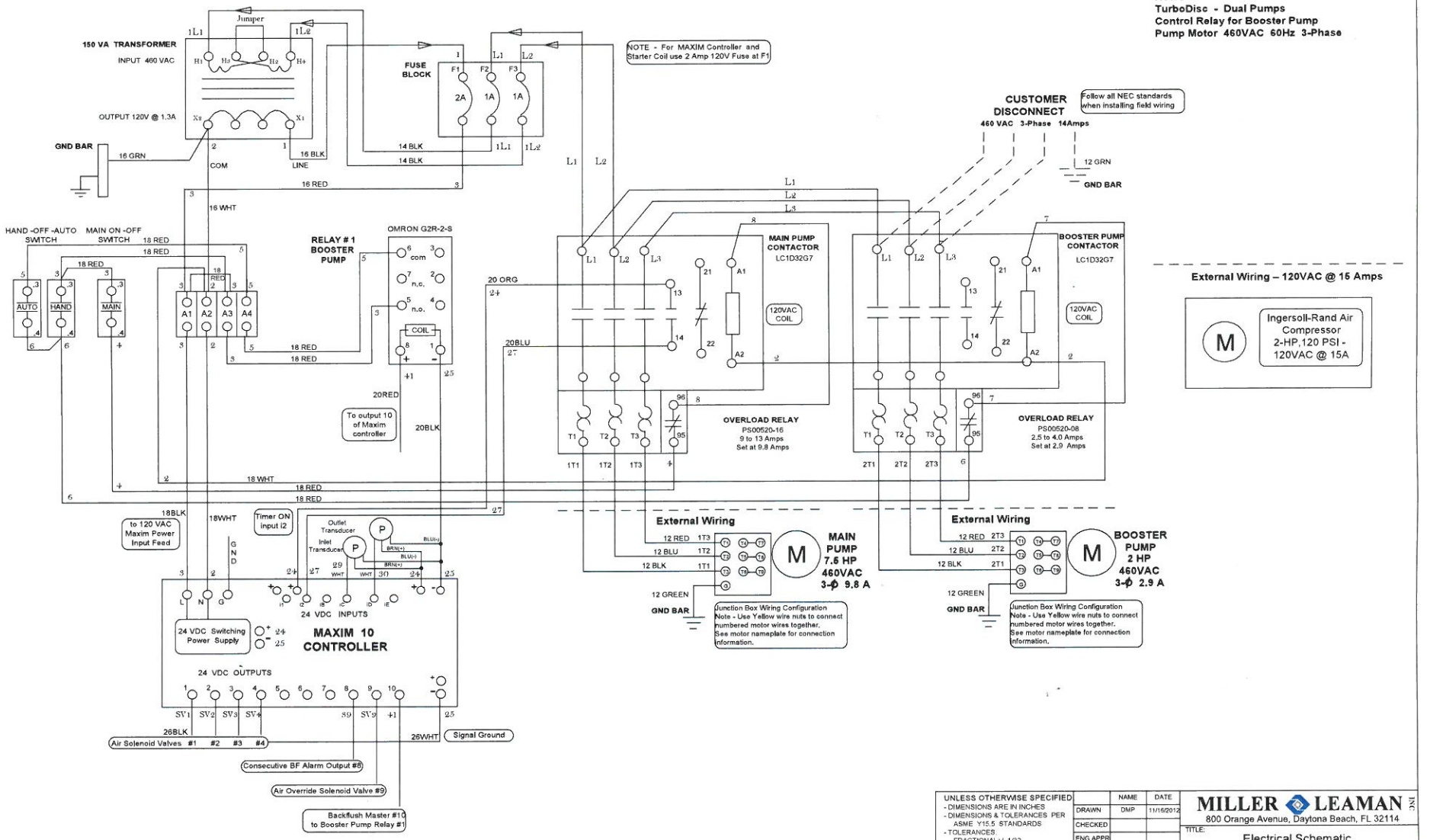
DRAWN	L.Brannan	3/13/12	
CHECKED			
ENG APPR.			
MKT APPR.			
MLI File #ML21040-4C-MOD4		Rev A	SHEET 1 OF 1

SYSTEM REQUIREMENTS:
Electrical: 460VAC/3Ph/60HZ/15A
Air Supply: 2CFM @ 80 to 100 PSI
Water Supply @ Inlet: 10-25 PSI
System Design: 400 GPM
Dry Weight: 1400 lbs

TITLE:

Automatic Turbo Disc Filter Skid System

B1-ATD3(4)x4-130M-P400-A-MOD4



UNLESS OTHERWISE SPECIFIED
- DIMENSIONS ARE IN INCHES
- DIMENSIONS & TOLERANCES PER ASME Y15.5 STANDARDS
- TOLERANCES
FRACTIONAL +/- 1/32
ANGULAR +/- 1/4 deg
TWO PLACE DECIMAL +/- .02
THREE PLACE DECIMAL +/- .005

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	DMP	11/16/2012
CHECKED		
ENG APPR		
MFG APPR		
Q.A.		

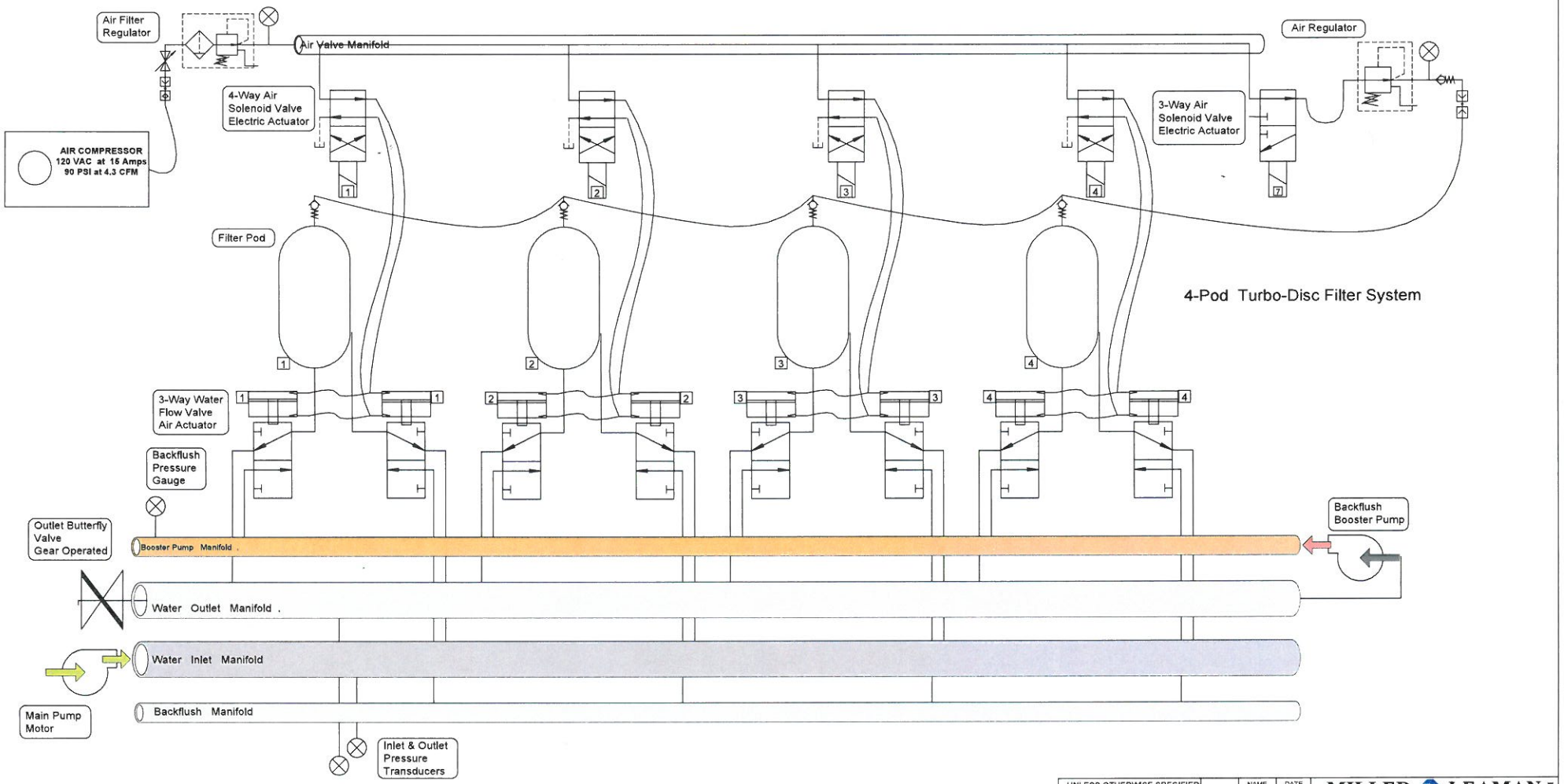
COMMENTS:

MILLER LEAMAN INC
800 Orange Avenue, Daytona Beach, FL 32114

TITLE:
Electrical Schematic
Automatic TurboDisc
Filter Skid System

SIZE	DWG. NO.
B	ML21061-4D-MOD4

SCALE:1:1 | WEIGHT: | SHEET 2 OF 3



UNLESS OTHERWISE SPECIFIED
- DIMENSIONS ARE IN INCHES
- DIMENSIONS & TOLERANCES PER ASME Y15.5 STANDARDS
- TOLERANCES:
FRACTIONAL +/- 1/32
ANGULAR +/- 1/4 deg
TWO PLACE DECIMAL +/- .02
THREE PLACE DECIMAL +/- .005

MATERIAL

FINISH

DO NOT SCALE DRAWING

	NAME	DATE
DRAWN	DMP	11/19/2012
CHECKED		
ENG APPR		
MFG APPR		
Q.A.		

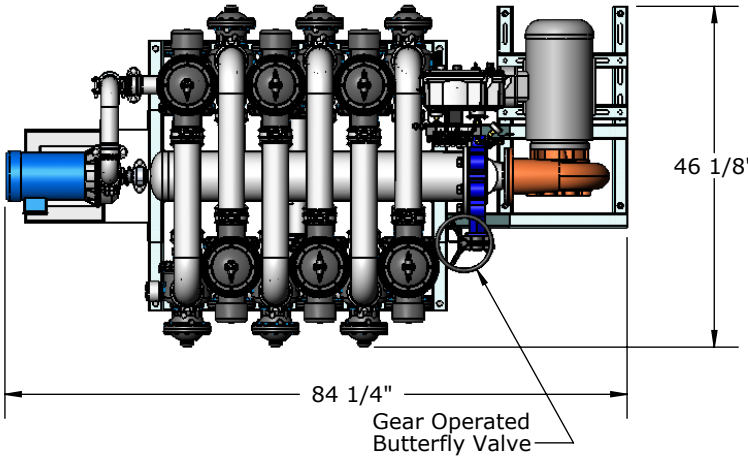
COMMENTS:

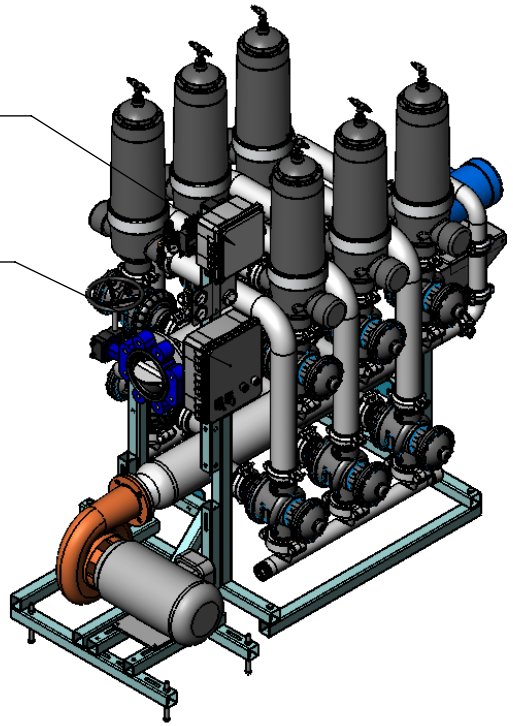
MILLER LEAMAN INC
800 Orange Avenue, Daytona Beach, FL 32114

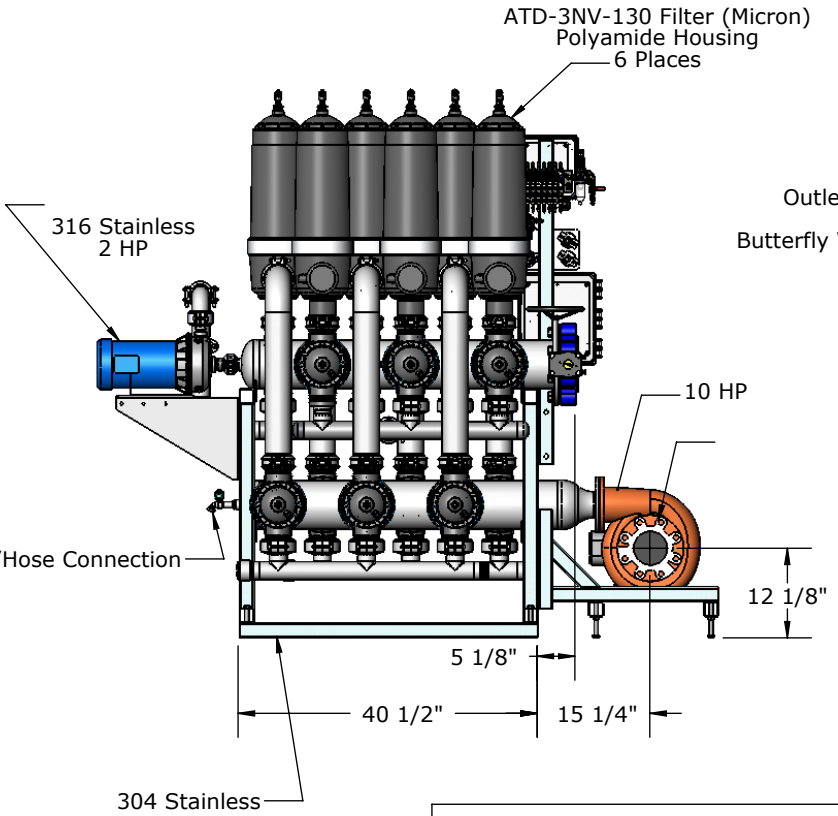
TITLE:
Piping diagram
Automatic Turbo-Disc
Filter Skid System

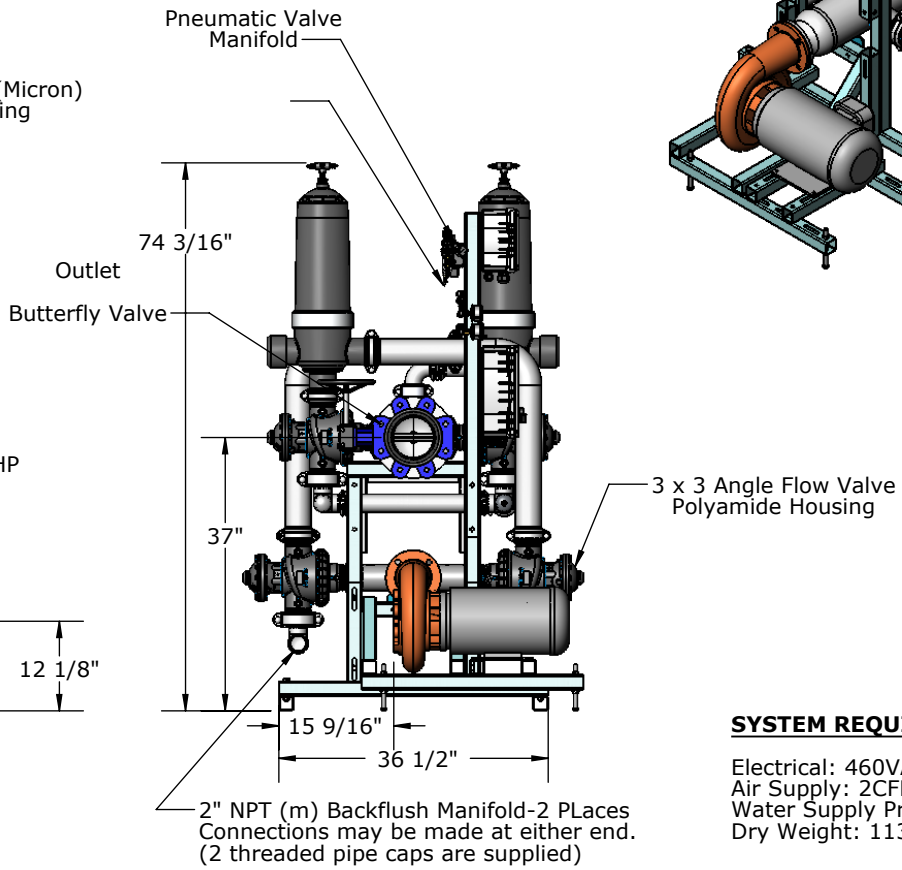
SIZE B | DWG. NO. ML21061-4D-MOD4

SCALE:1:1 | WEIGHT: | SHEET 3 OF 3







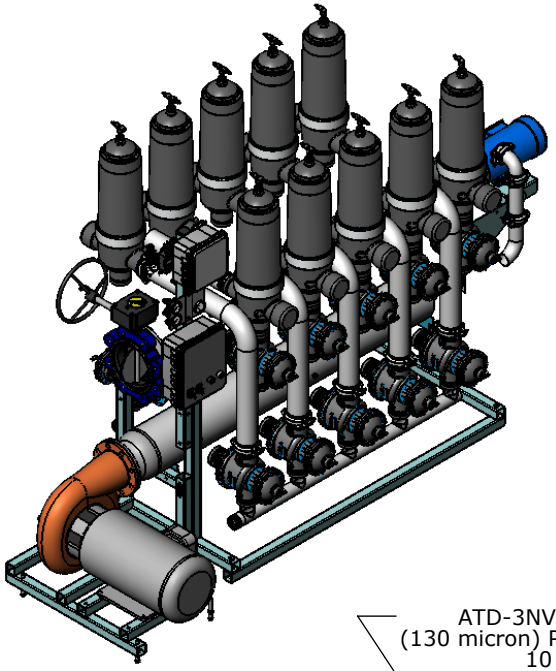


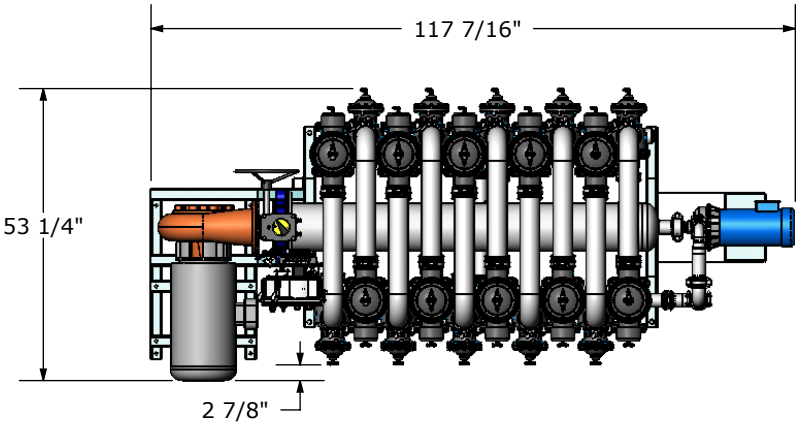
SYSTEM REQUIREMENTS

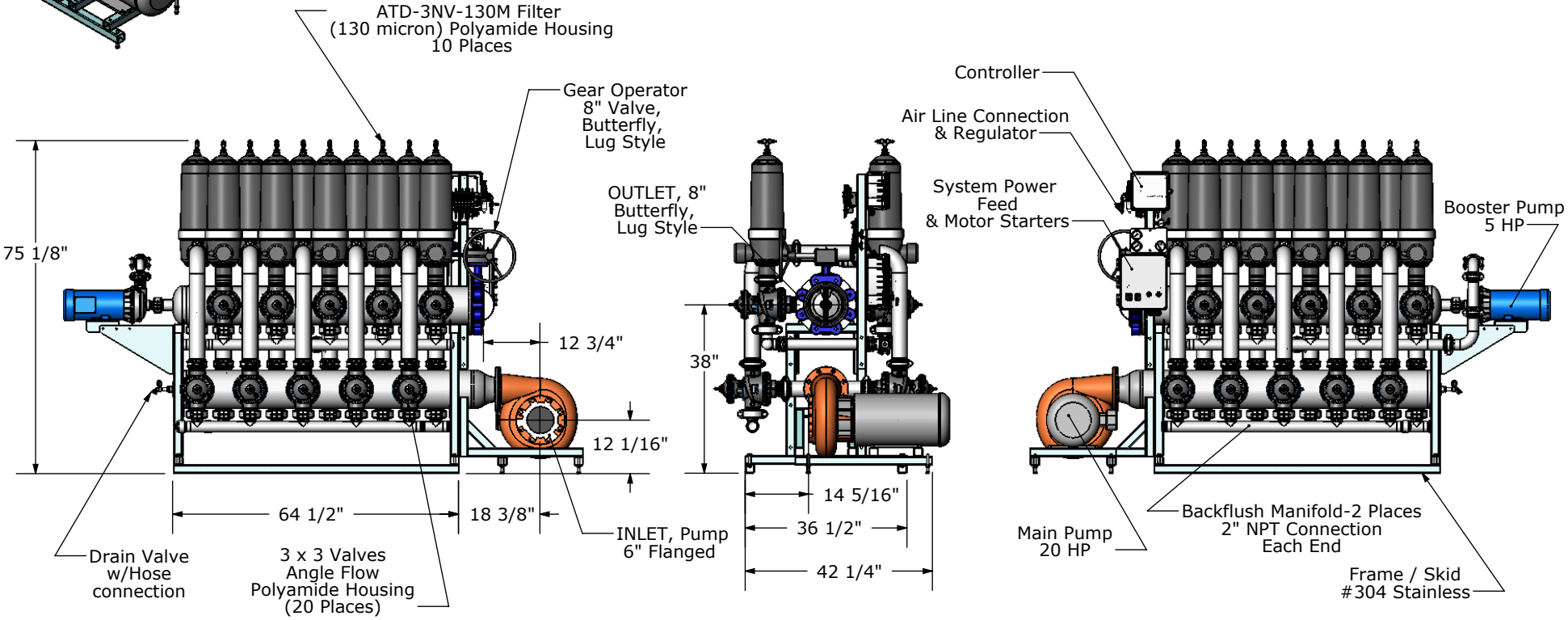
Electrical: 460VAC/3 Phase/60Hz/17A
Air Supply: 2CFM@80-100 PSI
Water Supply Pressure: 10-25 PSI
Dry Weight: 1130 Lbs.

PRODUCT SPECIFICATION	DRAWN	8/25/08	TITLE
	CHECKED		Automatic Turbo-Disc Filter Skid System B1-ATD3(6)x6-130M-P600-A
MILLER-LEAMAN INC. 800 Orange Ave. Daytona Beach FL 32114	SHEET 1 OF 1		

Rev. A







SYSTEM REQUIREMENTS:
Electrical: 460VAC/3Ph/60Hz/33Amps
Air Supply: 4CFM @ 80 to 100 PSI
Water Supply Pressure: 10-25 PSI
Dry Weight: 1650 lbs.

PRODUCT SPECIFICATION

MILLER-LEAMAN INC.

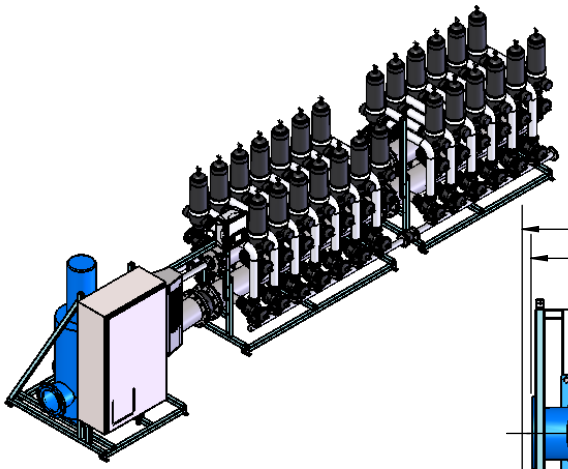
800 Orange Ave. Daytona Beach FL 32114

DRAWN	L.Brannan	3/31/09
CHECKED		
ENG APPR.		
MKT APPR.		

SHEET 1 OF 1

TITLE

Automatic Turbo-Disc
Filter Skid System
B2-ATD3(10)x8-130M-P1000-A



Doc.No. MD-451-3200-UT-86086-00023

PRODUCT SPECIFICATION

MILLER LEAMAN INC

800 Orange Ave. Daytona Beach FL 32114

DRAWN	J. Larsen	2/9/12
CHECKED		
ENG APPR.		
MKT APPR.		
Ref: ML21564	Sheet 1 of 1	Rev. B

SYSTEM REQUIREMENTS:

Electrical: 460VAC/3PH/60Hz/115A
Air Supply: 2 CFM @ 80-100 PSI(5.5-6.9 Bar)
Water Supply @ Inlet:10-25 PSI (.68-1.7Bar)
Dry Weight: 7600 Lbs
Wet Weight: 10,000 Lbs

TITLE:

AUTOMATIC TURBO-DISC FILTER SKID SYSTEM

B2-ATD3(26)x10-130M-P2400-A-MOD1

Turbo-Disc Filter
Full-Stream Systems

THE EVOLUTION OF AUTOMATIC FILTRATION

FOR WATER, WASTEWATER AND REUSE WATER

APPLICATIONS

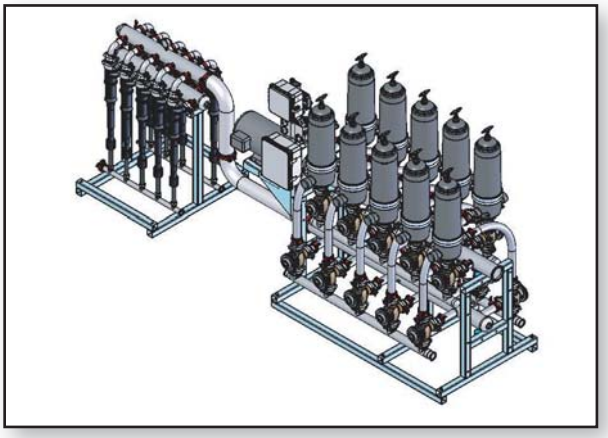
Automatic turboDisc Filter

Miller-Leaman's state-of-the-art automatic ***Turbo-Disc Filter*** sets the standard for water, wastewater, and reuse water applications. The modular design is available in single-pod and multiple pod models. Systems are available with and without pumps, and can be packaged with other filtration products and water treatment equipment. Using a fraction of the backwash water used by other automatic filters, the Turbo-Disc is effective in removing particulate (sand, sediment, etc.) and light fibrous contaminants (i.e. algae) found in surface water and other process water streams.

Typical Filtration Applications:

- Reclaimed Water
- Stormwater Runoff
- Wastewater
- Pre-filtration for Membranes (MF, UF, etc.)
- Well Water
- Surface Water (ponds, lakes, rivers)
- Process Cooling Water (cooling tower and chilled water)

16-Pod, 1,600 GPM Full-Stream System, complete with Booster Pump



Typical Multi-Staged Filtration System. High Efficiency Separators Combined with a Turbo-Disc Filter.

Turnkey Systems Include:

- Automatic Filters / Disc Cartridges
- Stainless Steel Inlet / Outlet / Backwash Manifolds
- Automatic Backwash Valves / Solenoids
- Miller-Leaman ***Maxim*** Backwash Controller, complete with differential-pressure switch-gauge
- Stainless Steel Frame and Skid Assembly
- Available with or without Pump and/or Booster Pump
- Motor Starter(s)– Single Point Electrical Connection
- Outlet Control Valve (on multiple pod systems only)
- Air-Override Feature (air enhances backwash efficiency)

Optional Equipment:

- Isolation Valves
- Pump Pre-Strainer
- Other Filtration Products (i.e. separators, bag/cartridge filters)
- Water Disinfection Equipment (i.e. UV, Ozone)
- SCADA Compatible Controls
- Air Compressor (if compressed air is not available)

Dunes Utilities – Reclaimed Water Filter Station. Filtering Reclaimed Water used for Irrigation.

MILLER LEAMAN INC

AUTOMATIC FILTER OPERATION

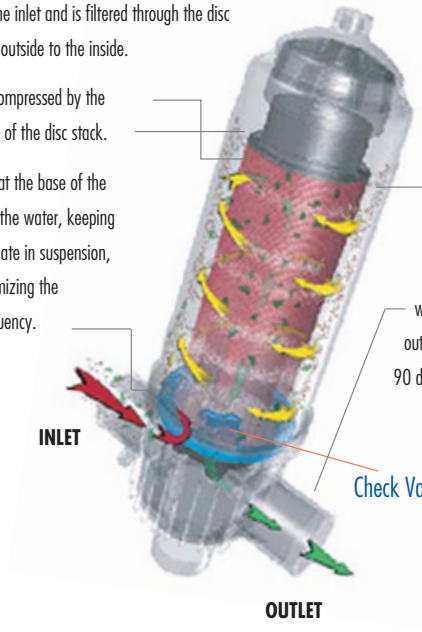
FILTRATION MODE

Water enters the inlet and is filtered through the disc stack from the outside to the inside.

The discs are compressed by the disc cap on top of the disc stack.

The spin plate at the base of the cartridge spins the water, keeping heavier particulate in suspension, therefore minimizing the backwash frequency.

Filtered contaminants collect on the exterior of the discs and throughout the depth of the discs, while filtered water exits through the outlet, either in-line or 90 degrees to the inlet.



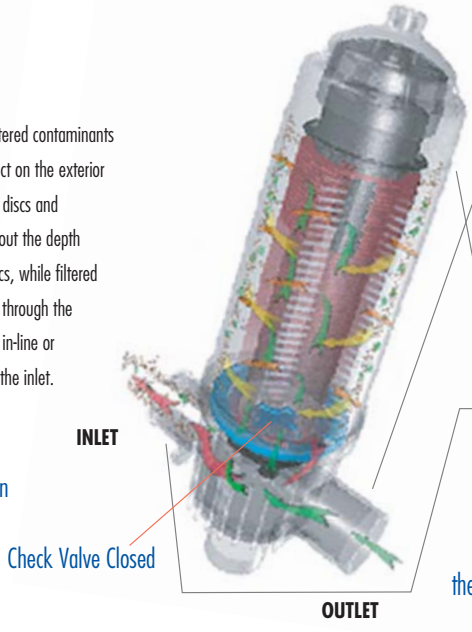
BACKWASH MODE

When the filter cartridge requires automatic cleaning:

Clean filtered water from the outlet manifold (green arrows) flows up through molded spray nozzles (orange arrows and white spray) centrifugally spinning and spraying the discs clean.

Simultaneously, the disc cap lifts hydraulically, decompressing the disc stack.

Dirty water and particulate exit through the filter inlet (red arrows) into the 2" flush manifold, which goes to drain.



When the backwash cycle is complete, the disc cap re-compresses the disc stack and the next filter is sequentially backwashed until the filter system is clean.

TECHNICAL DATA

Flow Rates for a Single Filter Pod*:

Multiple pods are manifolded for higher flow rates.

2"/70 GPM Max. Per Filter Pod
3"/100 GPM Max. Per Filter Pod

* Maximum flow rates vary greatly depending on water quality, solids loading, and micron size of the disc media. **De-rate flow to 50 GPM (per pod) with 50-micron disc media.**

Micron Options Available*:

50-micron (≈250 - mesh)
100-micron (≈150 - mesh)
130-micron (≈120 - mesh)
200-micron (≈ 80 - mesh)

* Centrifugal spinning action of heavy particles combined with the caking-effect achieved across the three-dimensional disc media, greatly increases the micron efficiency.

Pressure Rating:

All Systems Rated Up to 125 PSI

Temperature Rating:

All Systems Rated Up to 140°F

Materials of Construction / Technical Information:

Filter Housings: Polyamide
Filter Disc Media: Polypropylene
Gaskets and O-rings: EPDM
Filter Pod Clamp: Stainless Steel
Inlet / Outlet / Backwash Manifolds; Frame & Skid Assembly:
Type 304 Stainless Steel
Backwash Valves
Bronze (2" filter housings)
Cast Iron, Epoxy-Coated (3" filter housings)
Solenoids: Plastic / Brass

ENGINEERED

TO MEET

YOUR SPECS

Maxim Backwash Controller – 120-volt/AC
Features:

- Backwash based on Differential-Pressure, Elapsed Time or Manually.
- User Adjustment of Critical Control Functions (i.e. backwash duration, differential-pressure setting, etc.)

Pump(s) & Motor Starter Relay(s) Electrical:

- 460-volt / 3 Phase (standard) – Single Point Electrical

Outlet Control Valve: Cast Iron, Epoxy-Coated (Multiple pod systems only)
Air-Override Feature: 1/4" NPT connection for compressed air

- Air compressor is optional if compressed air is not available

800 Orange Avenue • Daytona Beach, FL 32114
phone: 386.248.0500 • toll free: 800.881.0320
fax: 386.248.3033 • www.millerleaman.com

MILLER LEAMAN INC

Stormwater Runoff Case Study

Manatee County Lena Landfill • Bradenton, Florida

"Automatic Disc Filter Preserves Land"

Located off Highway 64 in Bradenton Florida, the Lena Landfill in Manatee County has faced many obstacles in an effort to control their hazardous waste. Manatee County has a population of over 310,000 residents and collects over 350,000 tons of trash per year. Occupying over 330 acres of land, the landfill must bury the trash while preserving and protecting the environment in the surrounding area.

Manatee County Lena Landfill

One way of protecting the environment is to keep leachate, or hazardous liquids containing contaminants from decomposing trash within a landfill, from entering groundwater or surrounding rivers and ponds. To accomplish this, the landfill has a system to direct all run-off water and stormwater to a 120 acre settling pond. In 2005, Manatee County's Lena Landfill was facing fines and penalties which had to be addressed.

The Florida EPA (Environmental Protection Agency) requires that all water discharged to stormwater ditches and drains meet a quality standard of 29 NTU (Nephelometric Turbidity Units) or less. Turbidity represents the use of reflected light to measure the size or density of solid particles present in a liquid. The Lena Landfill was operating with a turbidity of 35-40 NTU. There were limited options on how to remedy the problem. One option was to build an additional settling pond, which would occupy 60 acres of the landfill's valuable land. Since the landfill is considered a Class 3 hazardous landfill, the land is considered to be extremely valuable on a square foot basis.

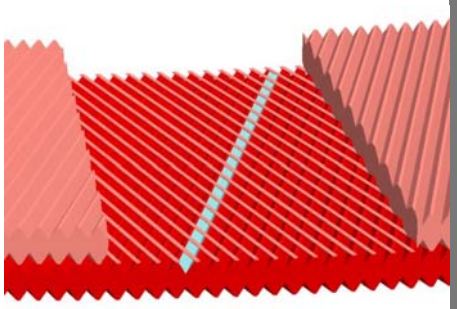
Outlet Water Piping from Miller-Leaman's 1,400 GPM Turbo-Disc Filtration System

(continued on page 2)

(continued from page 1)

Stormwater Runoff Case Study

Another option was to filter the water in the existing settling pond, preserving the unused acreage for future use to bury trash from the rapidly growing county.



Polypropylene Disc Media

To avoid millions of dollars of lost revenues, Manatee County contracted with the engineering firm PBS & J (Post, Buckley, Schuh & Jernigan) to develop a solution. David Weber of PBS & J specified the installation of an automatic disc filter system capable of handling two million gallons of water per day (2 MGD). The automatic Turbo-Disc Filter system was designed and manufactured by Miller-Leaman, Inc. of Daytona Beach, Florida. The system consists of (2) 24-pod systems, complete with booster pumps. As the water in the leachate, or settling pond rises to a particular level, submersible pumps activated by a float switch will engage. The water is then directed through the Turbo-Disc Filter systems and discharged into neighboring waterways, meeting the Florida EPA requirements. The filters can accommodate 1,400 gallons per minute (GPM) of contaminated particles and sediment.

Each filter pod is made up of a stack of polypropylene discs offering three-dimensional filtration capability. As the dirty water passes through the disc media, contaminated particles are trapped in the disc groves allowing clean water to flow from the system's outlet. When the filter pods require cleaning, an automatic backwash cycle is initiated due to a pre-set differential-pressure measurement across the filter. During the backwash, the filtration system's booster pumps engage, producing the optimal pressure to thoroughly clean the disc media using a minimal amount of backwash water. Only (2) filter pods are sequentially backwashed at a time; therefore, the downstream flow is uninterrupted during the duration of the backwash cycle.

Intake Water Piping to Turbo-Disc System with Booster Pumps

Filtering existing stormwater retention ponds is a very cost-effective solution for other high value real estate developments, such as shopping centers and commercial properties, where the availability of land is scarce or non-existent.

Reclaimed Water Case Study

MILLER LEAMAN INC

Dunes Community Development District • Flagler Beach, Florida

"Filtering Reclaimed Water"

The state of Florida's population is growing by more than 1,000 people per day. This phenomenal growth is certainly beneficial to the state's economy; although, it comes with a demanding toll on precious natural resources. Every person and business that migrates to Florida is competing with the finite supply of fresh water. Traditionally, the primary source of water has been groundwater; however, the state of Florida has shown a great deal of foresight in encouraging the development of alternative water supplies to meet the ever-increasing water demands. Reclaimed water is one of these alternative supplies and the state of Florida can be proud to be a national leader in the use of it. Over 60 percent of all reclaimed water in the state of Florida is being used for agricultural and landscape irrigation, with the balance used for ground water recharge and industrial use.

Ocean Hammock—The Dunes

Located in Palm Coast, Florida is the Dunes Community Development District made up Hammock Dunes, Island Estates and Ocean Hammock. This rapidly growing residential and golf course community is bounded by the Atlantic Ocean on one side and the Intercoastal Waterway on the other. The 2,120 acre development is an excellent example of the efficient use of reclaimed water. The Dunes Community Development District supplies reclaimed water for irrigation to residential and common areas, as well as two golf courses. Total usage is approximately 690 million gallons per year (1.9 million gallons per day). The reclaimed water is provided by the Dunes Community Development wastewater treatment facility (Dunes Utilities). The reclaimed water coming from Dunes Utilities flows into three lined reclaimed storage ponds, which is then pumped throughout the purple reclaimed water piping system by three irrigation pump stations.

One major obstacle that had to be overcome was related to the filtration of the reclaimed water. As the reclaimed water flows into the open ponds, the water quality significantly deteriorates when exposed to sunlight and the open atmosphere. One can commonly find sediment, algae, snails, mussels, bloodworms and other creatures present in reclaimed water ponds. Other than a coarse strainer, there was no filtration equipment previously installed on the system, resulting in constant sprinkler plugging. The first step towards resolving the problem was the installation of manual filters in (15) zone locations. This solved the problem of sprinkler orifice plugging; however, the manual filters proved to be labor-intensive, sometimes needing to be cleaned on a daily basis. Dunes Utilities sought out various filtration technologies, which would handle the water quality present in the reclaimed water holding ponds while minimizing manual maintenance.

Miller-Leaman's automatic Turbo-Disc Filter system installed at Dunes Utilities; current filtration capacity is approximately 4,500 GPM

(continued on page 2)

MILLER LEAMAN INC

Reclaimed Water Case Study

(continued from page 1)

Miller-Leaman's fully operational trailer; used for demonstration and water testing purposes

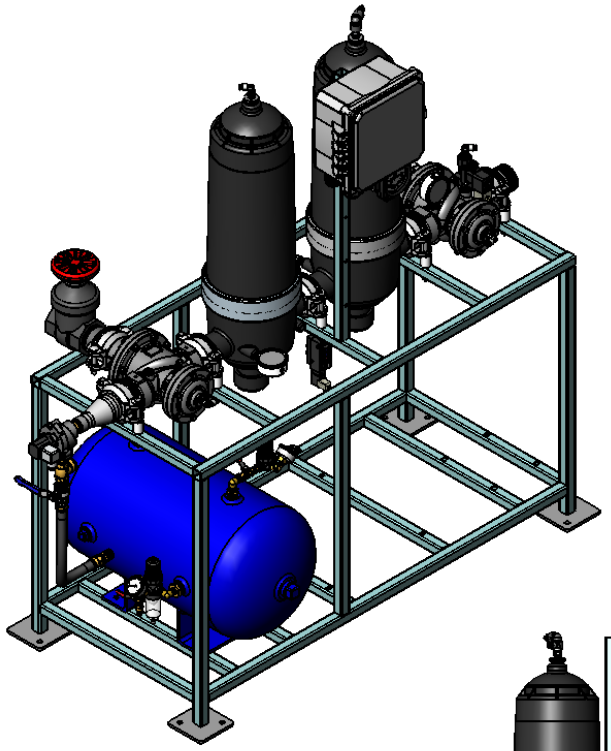
The filtration system was designed and manufactured by Miller-Leaman, Inc. of Daytona Beach, Florida. Miller-Leaman, in business since 1991, manufactures a range of unique and innovative filtration products including a fully automatic, self-cleaning disc filter technology called the *Turbo-Disc Filter*.

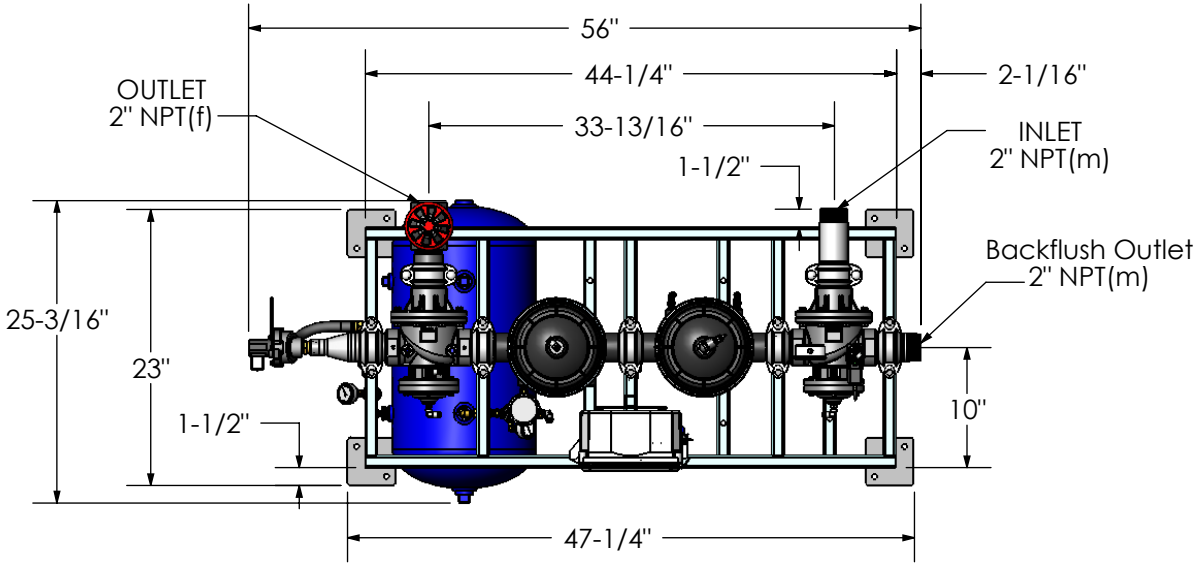
The *Turbo-Disc Filter* is particularly well suited for organic contaminants typical of open reclaimed water ponds (and surface water applications in general) because the filter media is three-dimensional, unlike a screen filter which is two-dimensional. As water passes through the disc media, the depth of the discs captures the soft fibrous contaminants which can extrude through a two-dimensional screen filter. As the differential pressure across the filter system reaches an adjustable set point, the *Turbo-Disc Filter* goes through a backwash cycle, sequentially flushing each filter housing until the entire filter system is clean. Other desirable attributes of the *Turbo-Disc Filter* include a small footprint and a minimal amount of backwash water volume compared to other automatic filters (i.e. sand filters).

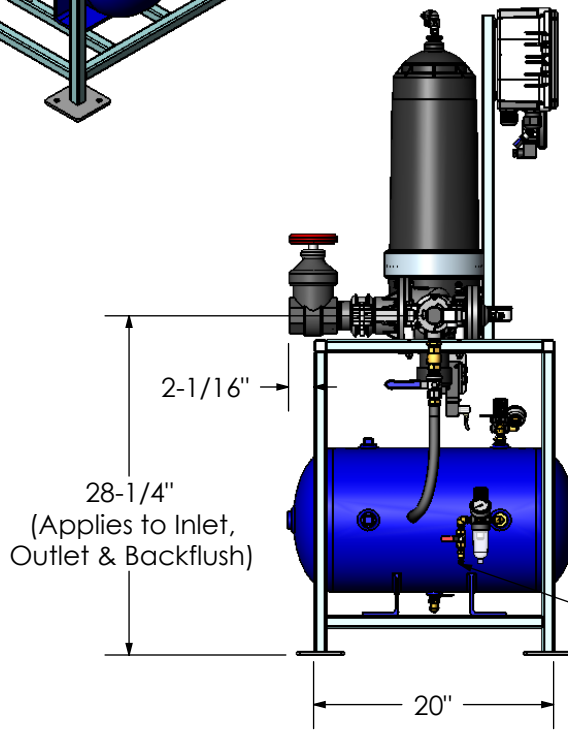
Initially the thought was to install (15) automatic *Turbo-Disc Filters* to replace the various manual filters at each zone location. After further discussion between Dunes Utilities and Miller-Leaman, it was concluded that a large central filtration system was the most cost-effective approach. In an effort to familiarize the Dunes with their *Turbo-Disc Filter* technology, Miller-Leaman transported their fully operational demonstration trailer to the site. The demo trailer has the ability to pump water from the actual water source to determine the solids' loading (PPM), the particle distribution size and other important variables. The filter housings in the demo trailer are transparent, allowing the customer to visualize the effectiveness of the filter, both in filtration and backwash modes.

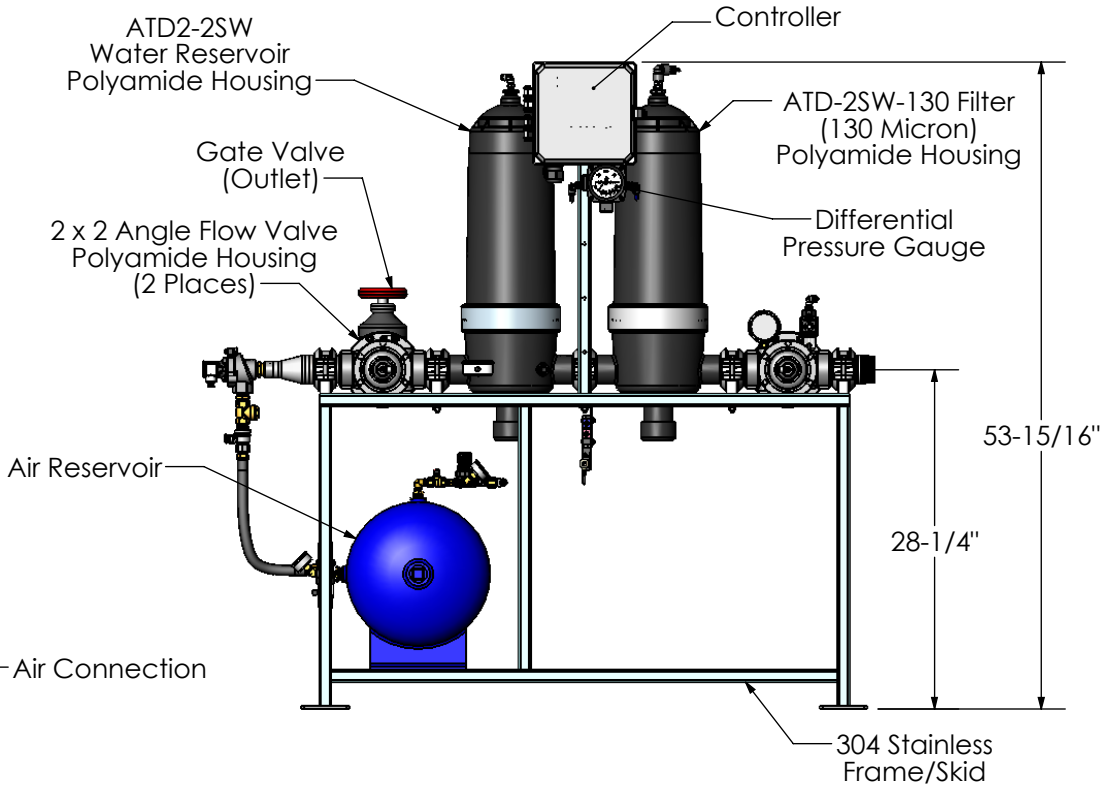
After the demonstration, Miller-Leaman worked with Dunes' personnel to properly size the *Turbo-Disc Filter* system, as well as customize it for their needs. For example, because of the proximity to the ocean and the corrosive environment it presents, all the manifolds on the filtration system were fabricated out of Type 316 stainless steel versus standard Type 304 stainless construction. The system was also designed modularly, so it could be expanded over time as the Dunes development grows and the reclaimed water demand increases. Miller-Leaman was also contracted by the Dunes to fabricate custom stainless steel manifolds, allowing additional *Turbo-Disc Filter* modules to be added over time. The first system was designed to accommodate 3,000 GPM; since then an additional filter module has been added to accommodate the current demand of 4,500 GPM.

Custom Type 316 stainless steel manifolding fabricated by Miller-Leaman to accommodate future expansion of the Turbo-Disc Filter system









SYSTEM REQUIREMENTS
Controller: 115VAC/60Hz/1A
Water Supply: 70 GPM Max.
@ 60 PSI Max.

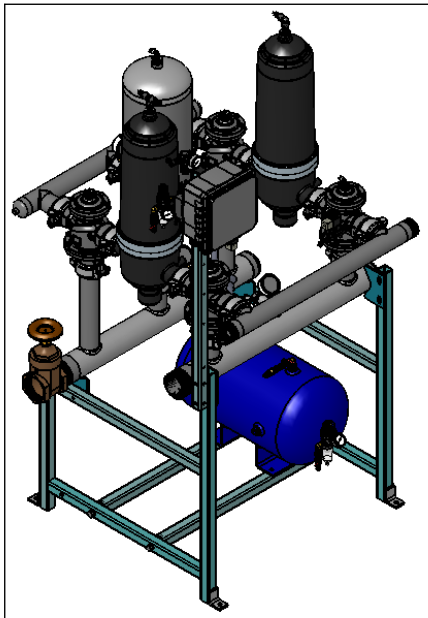
PRODUCT SPECIFICATION

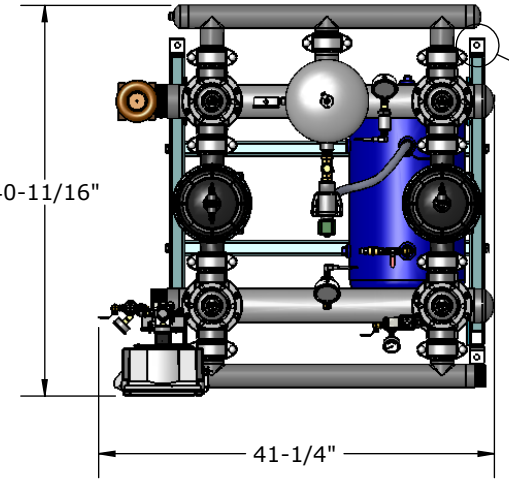
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

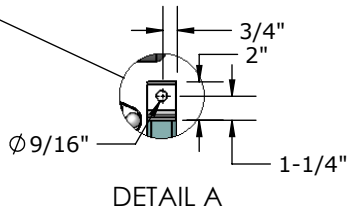
DRAWN	J. Larsen	7/7/10
CHECKED		
ENG APPR.		
MKT APPR.		

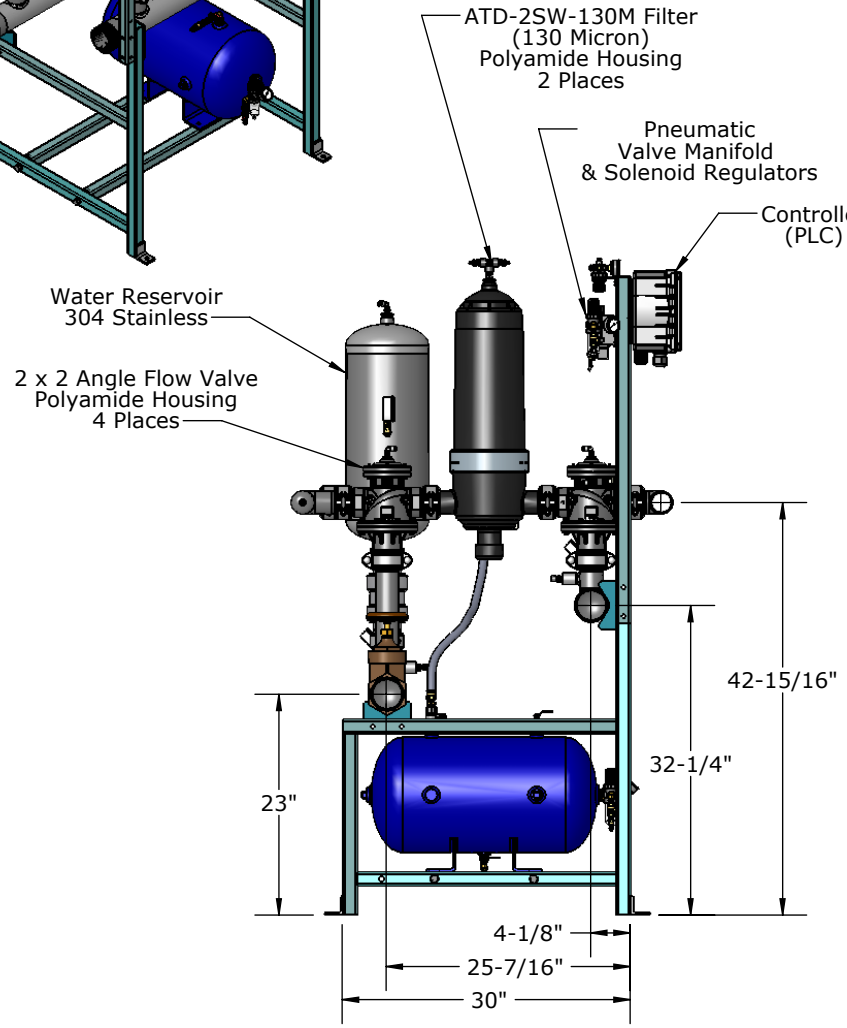
SHEET 1 OF 1

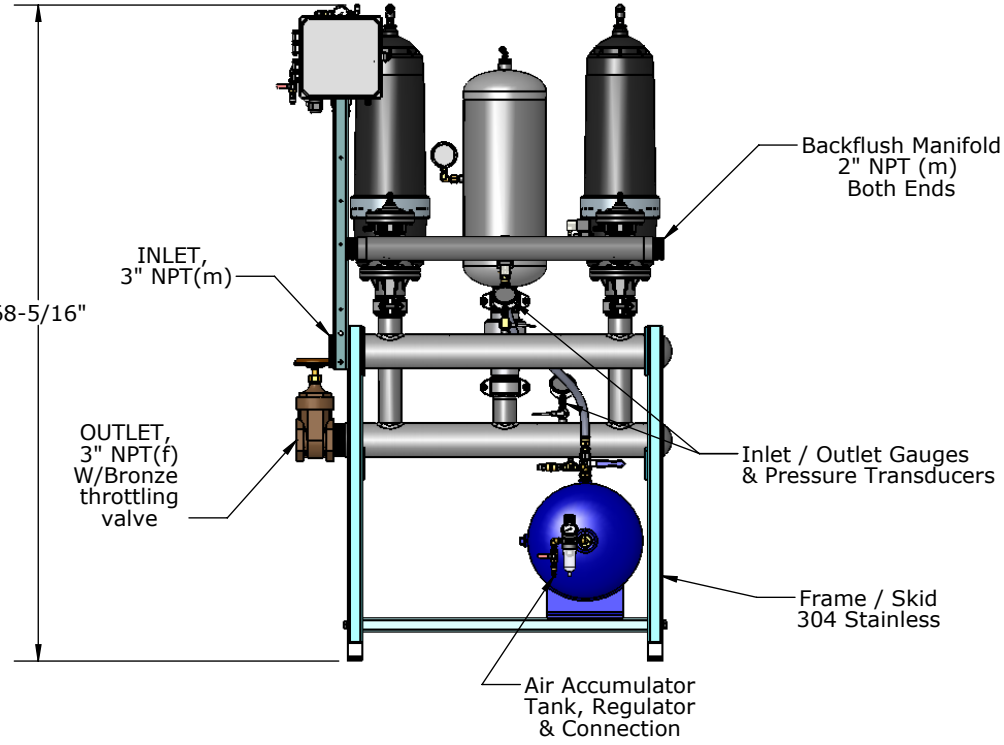
TITLE
Single Pod Air-Assist
Turbo-Disc Filter System
AA-ATD2(1)x2-130M-A









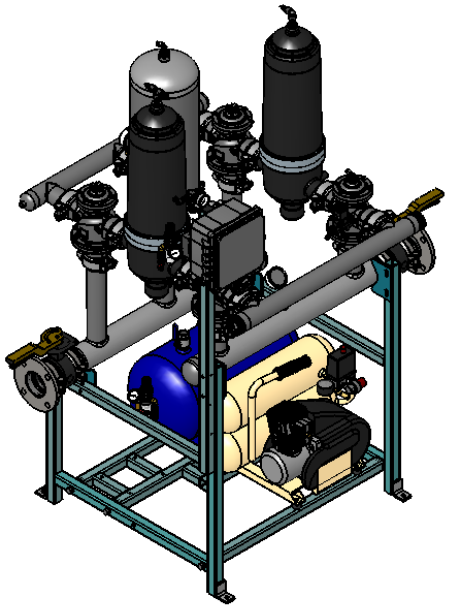


PRODUCT SPECIFICATION	DRAWN	L.Brannan	8/29/11
	CHECKED		
	ENG APPR.		
	MKT APPR.		
	MLI File #	ML21113-MOD4	SHEET 1 OF 1

MILLER LEAMAN INC
800 Orange Ave. Daytona Beach FL 32114

SYSTEM REQUIREMENTS:
Electrical: 120VAC/60Hz/1Ph/1A
Air Supply: 3 CFM @ 100 - 120 PSI
Water Supply @ Inlet: 0 - 75 PSI
Flow Range: 0 - 140 GPM
Dry Weight:306 lbs

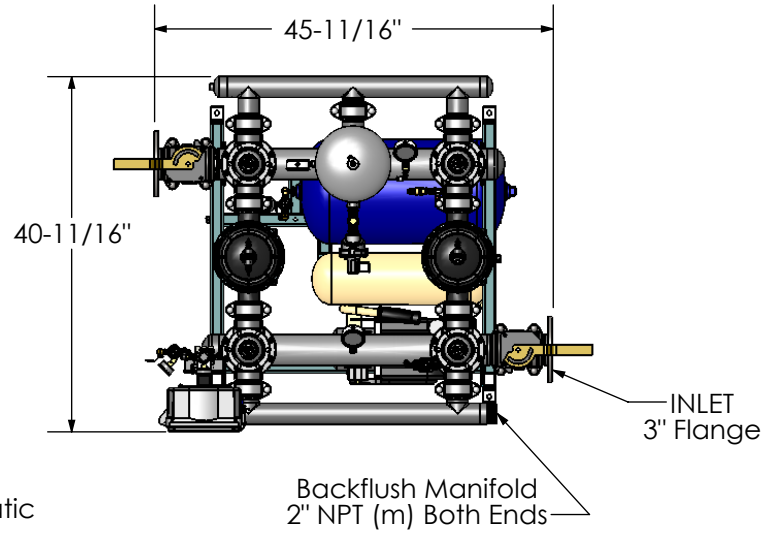
TITLE:
2 Pod Air Assist Automatic Turbo Disc Filter Skid Assembly
AA-ATD2(2)x3-130M-A-MOD4_P

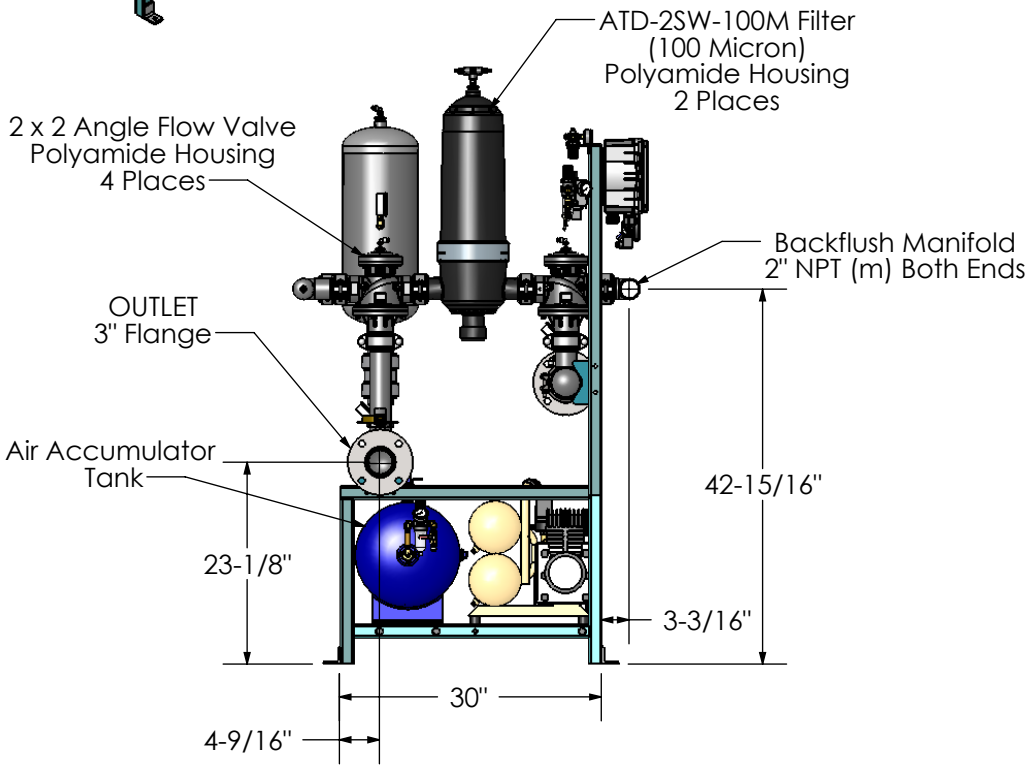


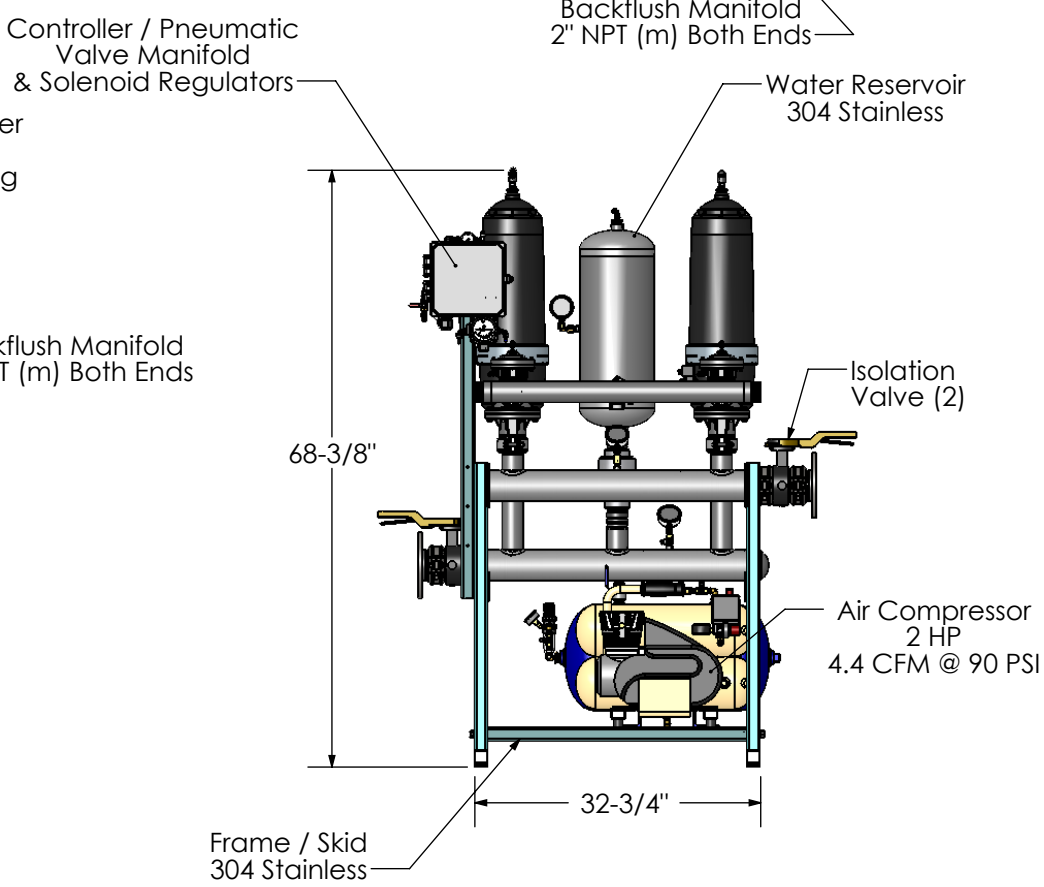
SYSTEM REQUIREMENTS

Electrical Controller & Compressor:
120VAC/1 Phase/60Hz / 16A

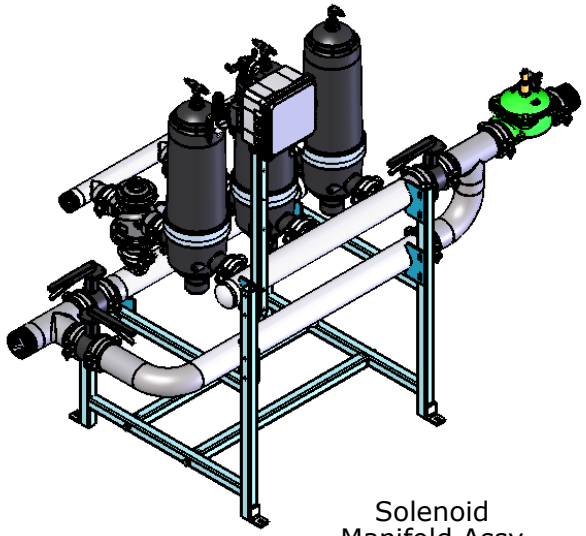
Flow: 100 GPM MAX.

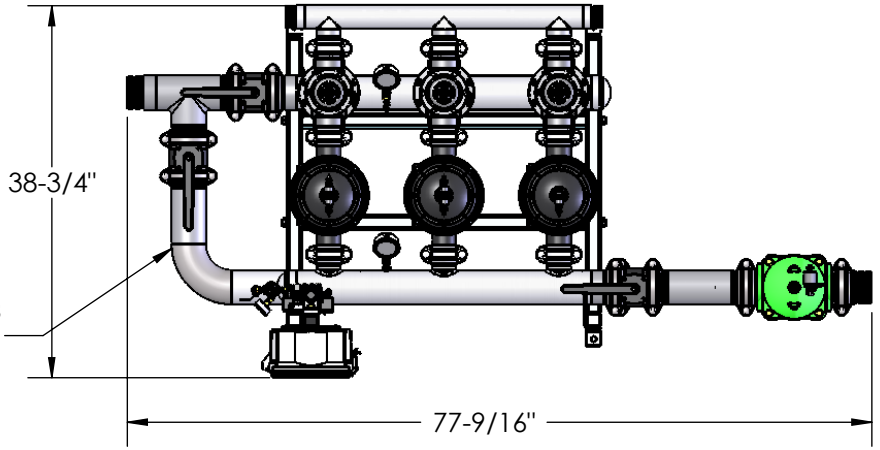


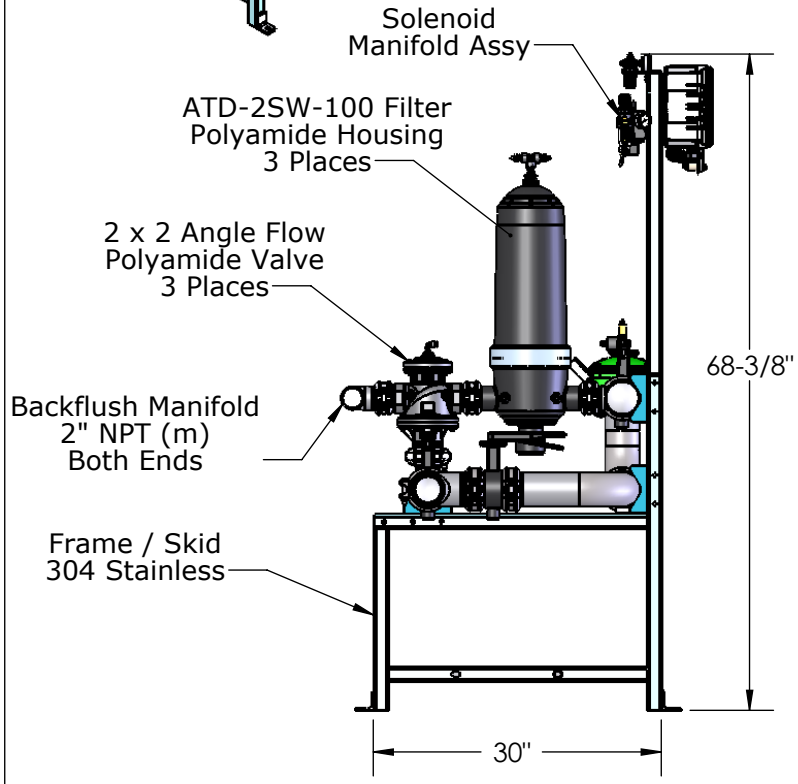


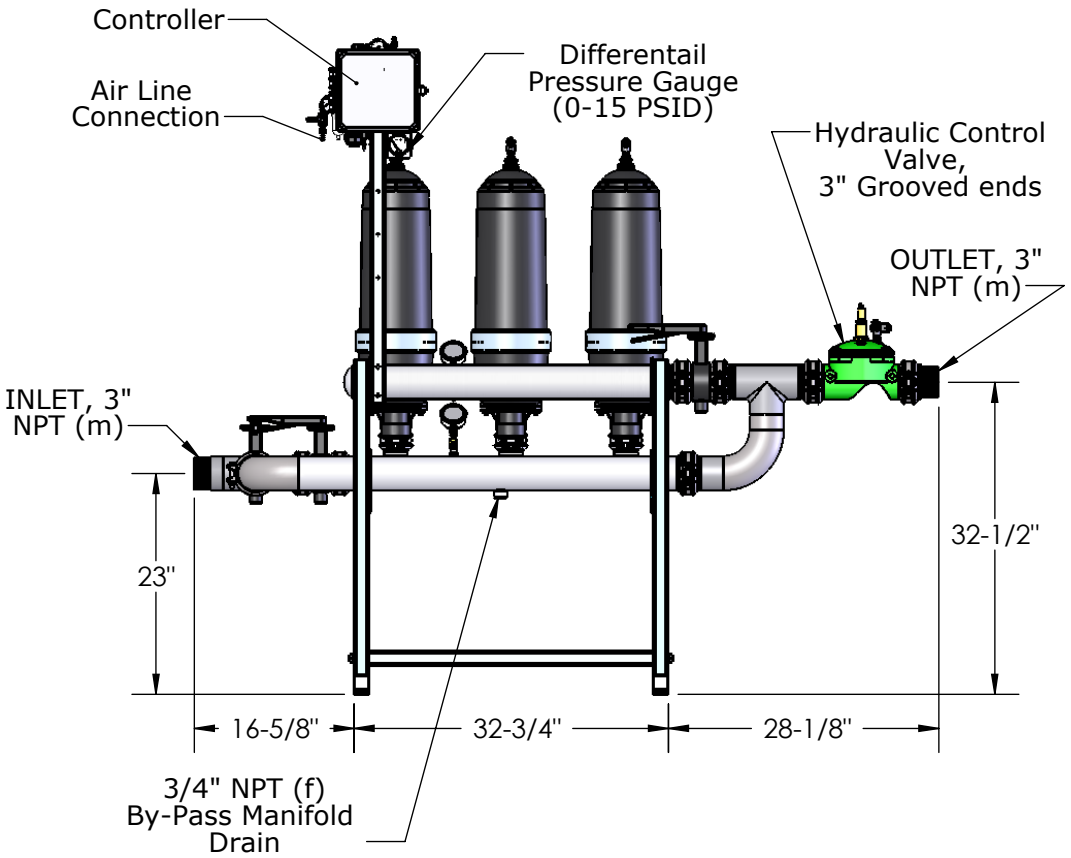


PRODUCT SPECIFICATION	DRAWN	J. Larsen	5/4/11	TITLE: 2 Pod Air-Assist Automatic Turbo-Disc Filter Skid System AA-ATD2(2)x3-100M-AC-MOD3
	CHECKED			
MILLER-LEAMAN INC. 800 Orange Ave. Daytona Beach FL 32114	ENG APPR.			
	MKT APPR.			
	SHEET 1 OF 1			









SPECIFICATIONS

Electrical: 120VAC/1PH/60Hz/1A
(Standard Plug)
Water Flow Rate: 50 - 210 GPM
Water Pressure: 80-100 PSI @ Inlet
Air Supply: 2 CFM @ 80-100 PSI
Dry Weight: 350 lbs

PRODUCT SPECIFICATION

MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

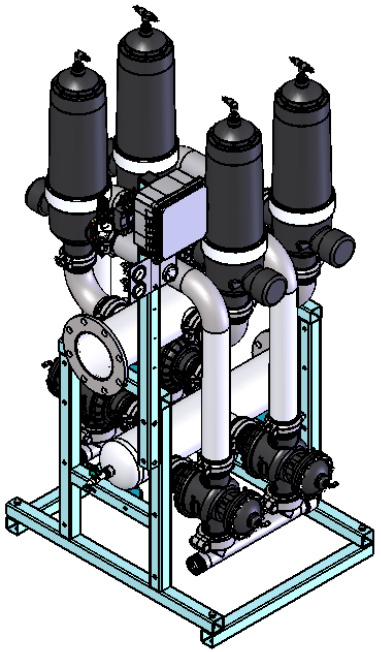
DRAWN	L.Brannan	2/17/10
CHECKED		
ENG APPR.		
MKT APPR.		

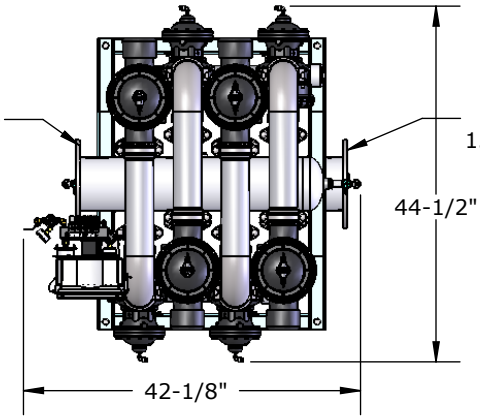
SHEET 1 OF 1

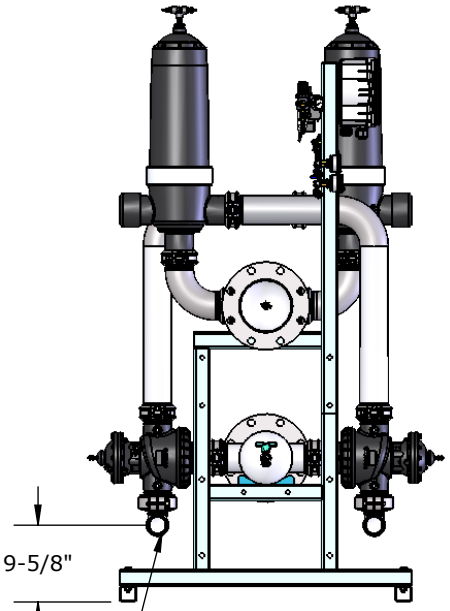
TITLE

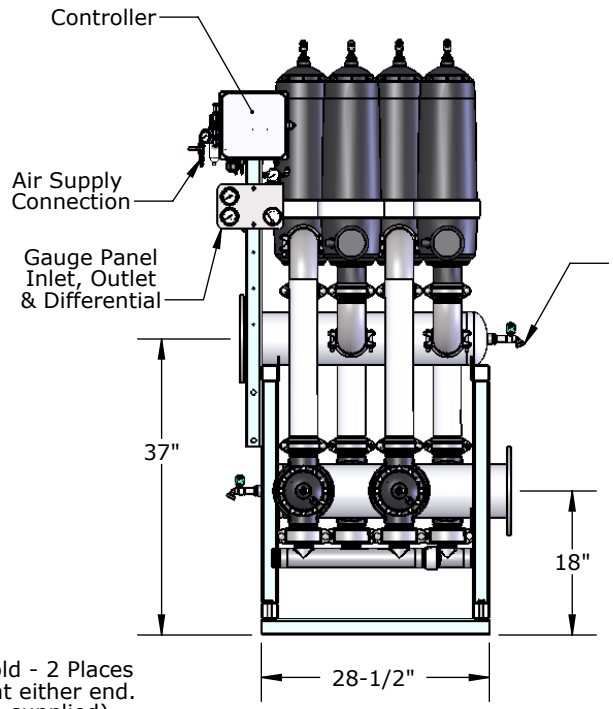
Automatic Turbo-Disc
Filter Skid System
ATD2(3)x3-100M-S3-A-MOD2

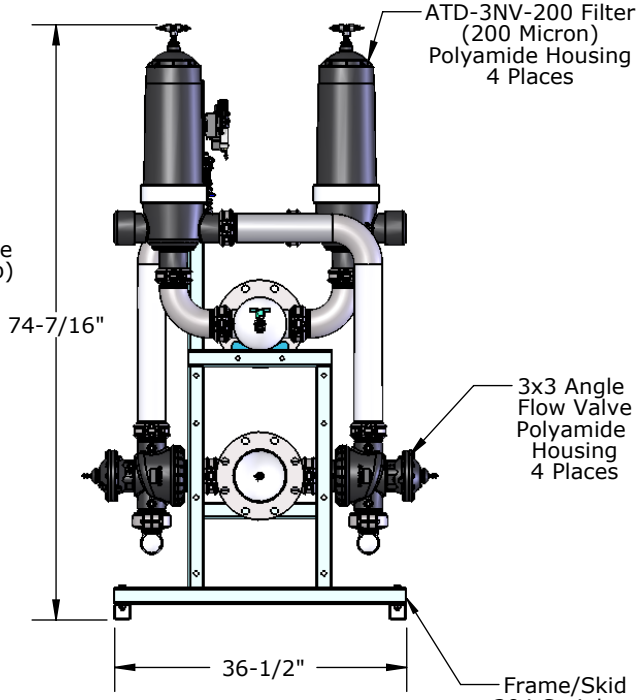
ML21103









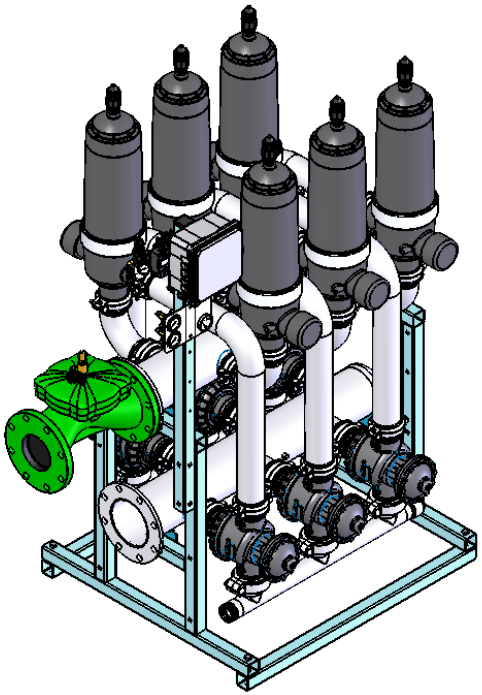


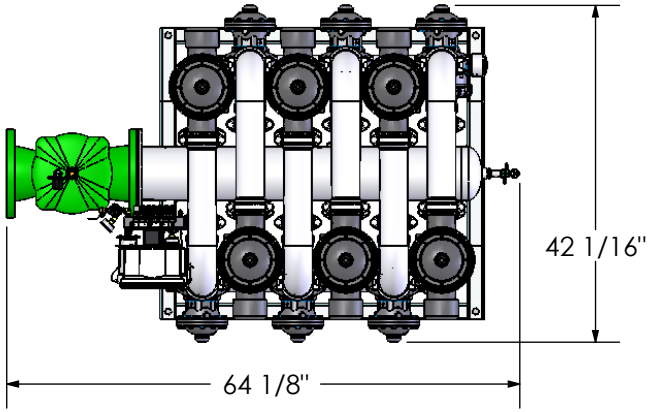
SYSTEM REQUIREMENTS
Electrical: 120VAC/60Hz/1Ph/2 Amps
Air Supply: 2 CFM @ 80-100PSI
Water Supply @ Inlet: 65 min-150 PSI Max
Water Flow Rate: 400 GPM Max
Dry Weight: 450lbs

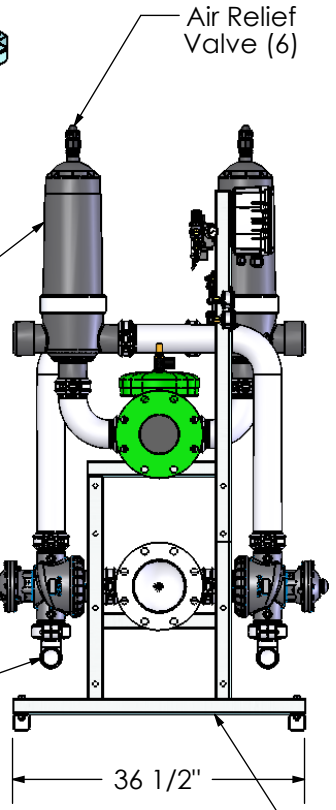
PRODUCT SPECIFICATION

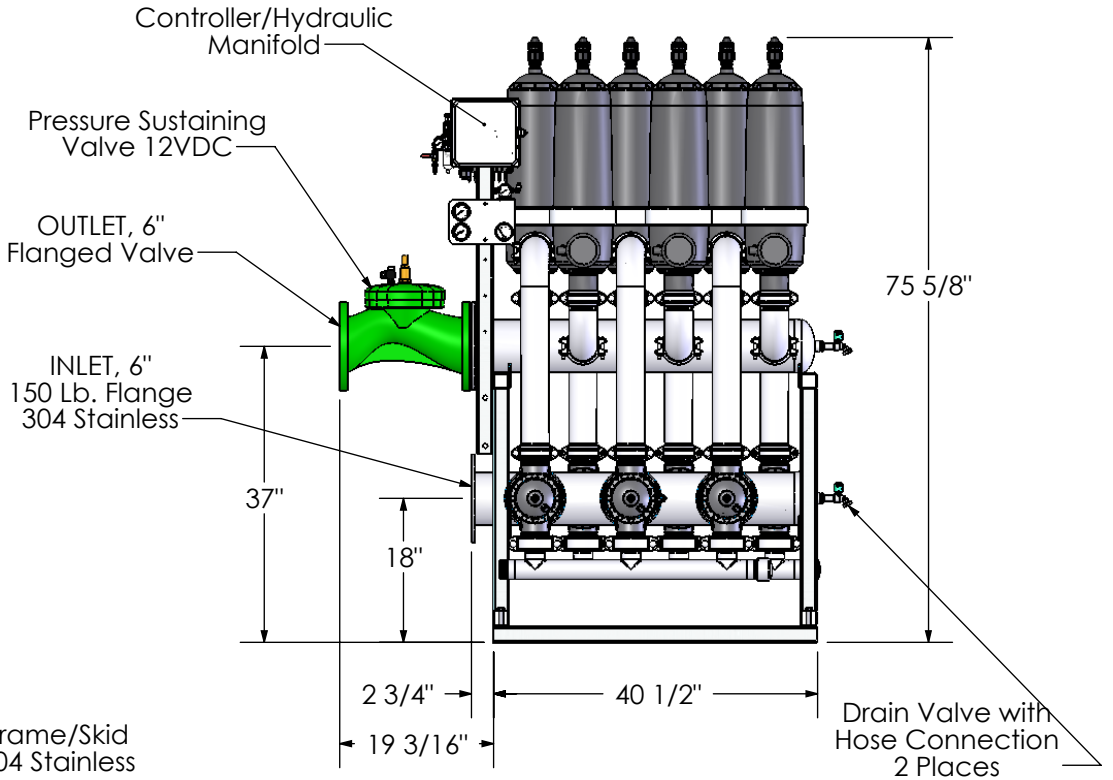
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

DRAWN	J. Larsen	7/7/11	TITLE
CHECKED			Automatic Turbo-Disc Filter Skid System ATD3(4)x6-200M-A-MOD2
ENG APPR.			
MKT APPR.			
SHEET 1 OF 1	Ref: ML21073-4A-MOD1	Rev. --	









SYSTEM REQUIREMENTS
Electrical: 12VDC/3 Amps
Water Supply Pressure: 30 PSI
Water Flow Rate: 350-600 GPM

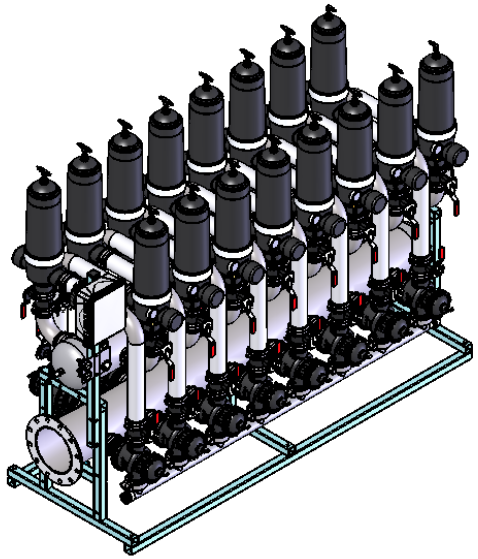
PRODUCT SPECIFICATION

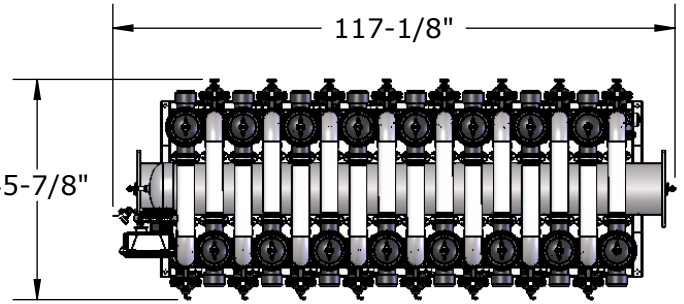
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

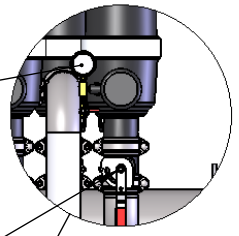
DRAWN	J. Larsen	11/6/08
CHECKED		
ENG APPR.		
MKT APPR.		

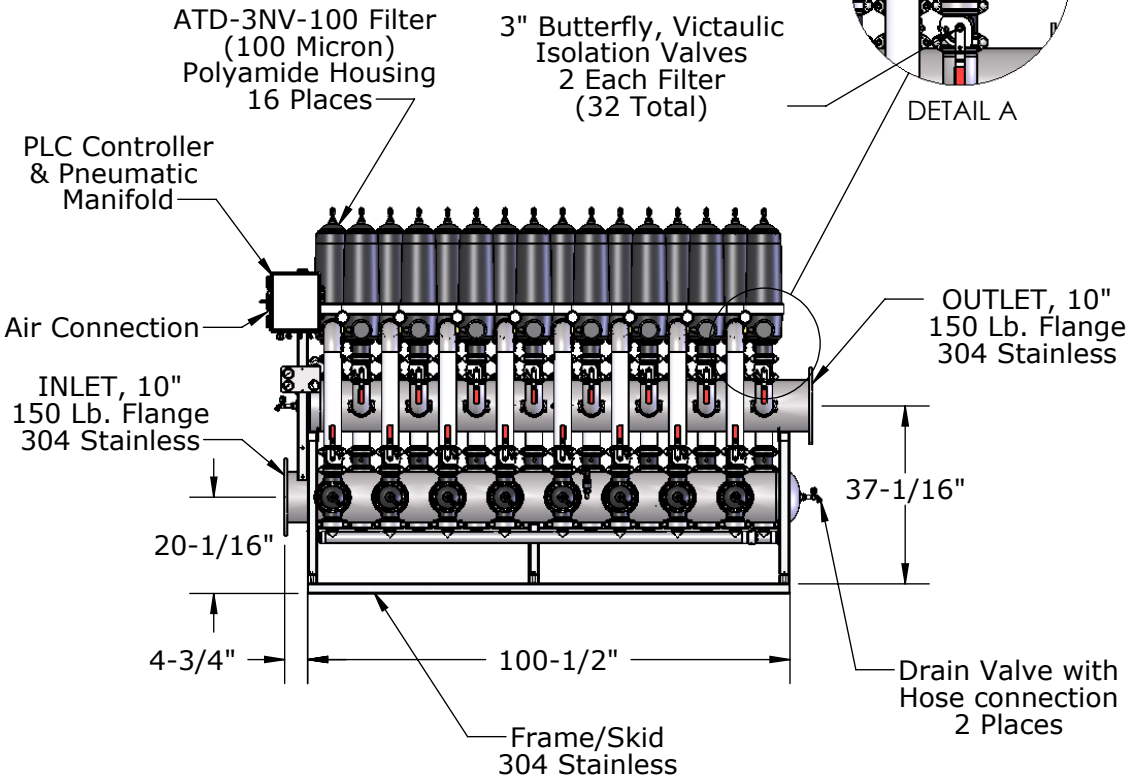
SHEET 1 OF 1

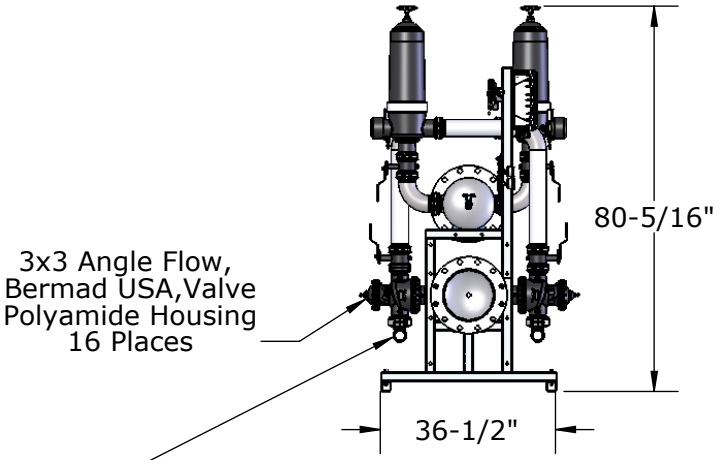
TITLE
Automatic Turbo-Disc
Filter Skid System
ATD3(6)x6-200M-S6











SYSTEM REQUIREMENTS
Controller: 120 VAC/60Hz/1 Amp
(Standard Plug)
Air Supply: 4CFM Min. @ 80-100 PSI
Water Pressure: 65-125 PSI @ Filter Inlet
Water Flow Rate: 100-1600 GPM
Weight: 1900 Lbs.

PRODUCT SPECIFICATION

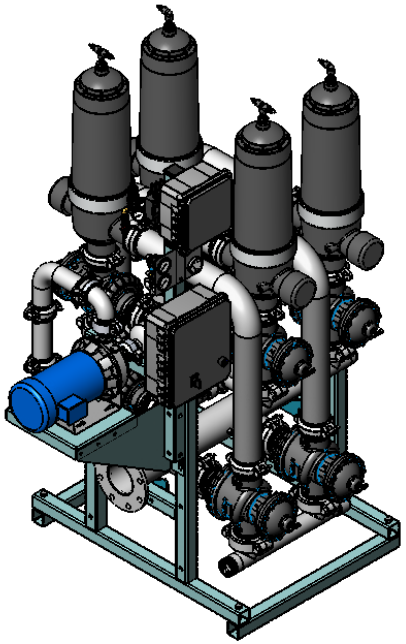
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

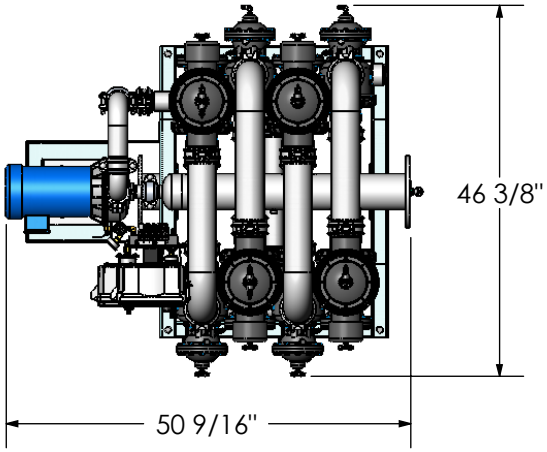
DRAWN	L.Brannan	5/28/10
CHECKED		
ENG APPR.		
MKT APPR.		

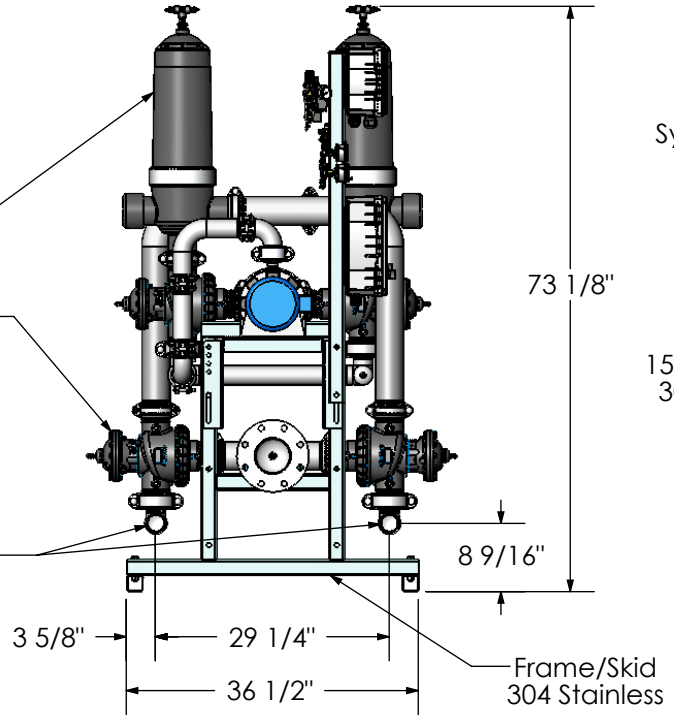
SHEET 1 OF 1

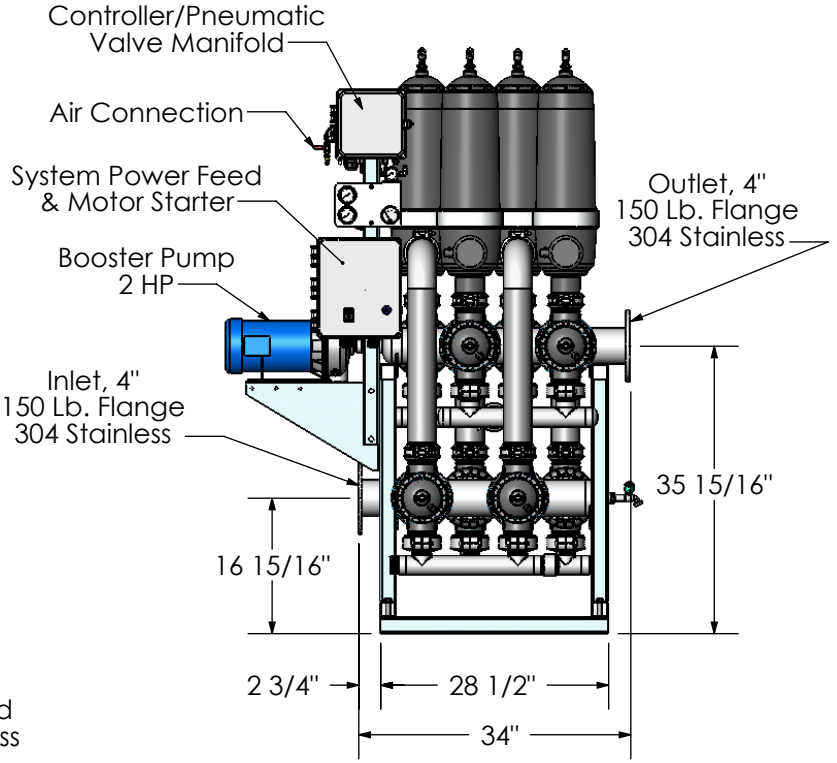
TITLE
Automatic Turbo-Disc Filter Skid System
ATD3(16)x10-100M-A-MOD1
US Patent #6,419,826

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED









SYSTEM REQUIREMENTS

Electrical: 460VAC/3 Phase/60Hz/4A
Air Line: 2CFM @ 115 PSI
Water Pressure: 30-75 PSI @ Filter Inlet
Water Flow Rate: 100 -400 GPM

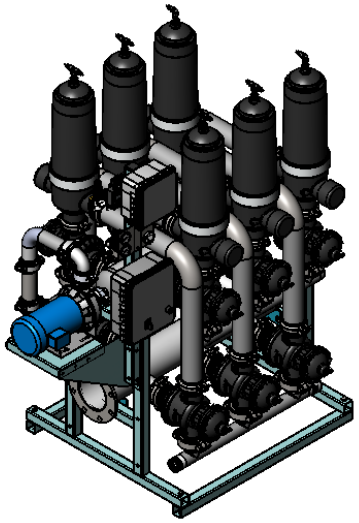
PRODUCT SPECIFICATION

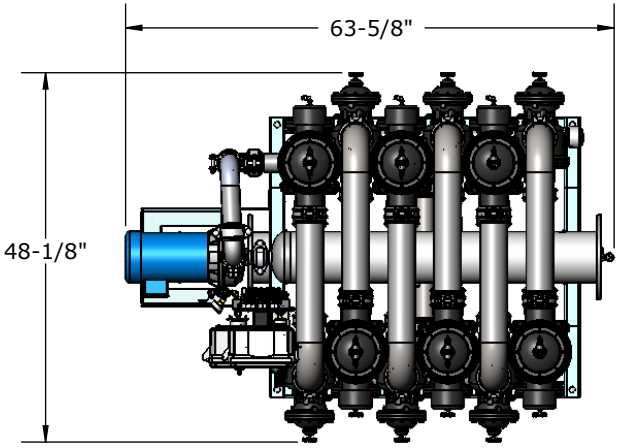
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

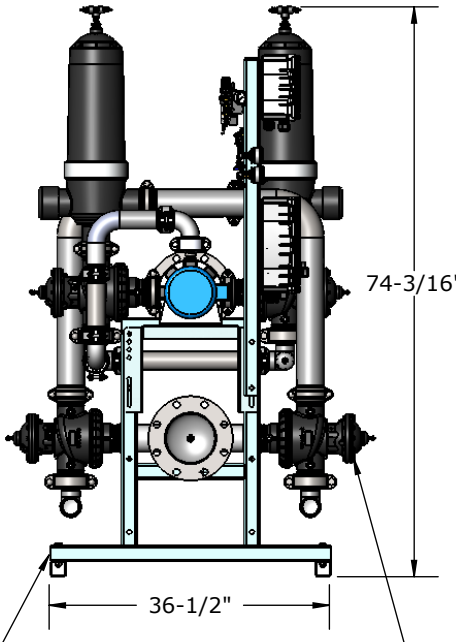
DRAWN	J. Larsen	6/17/08
CHECKED		
ENG APPR.		
MKT APPR.		

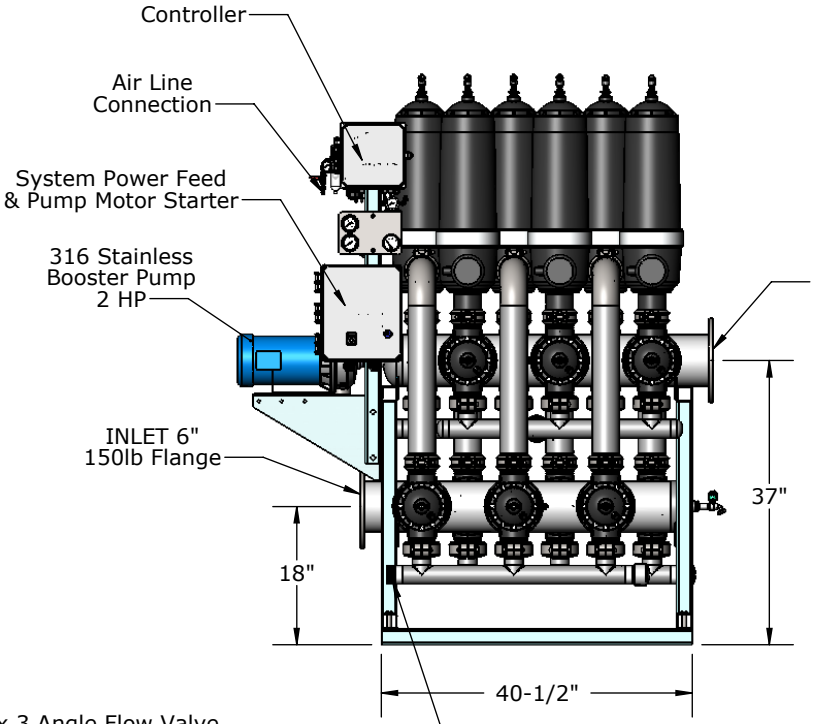
SHEET 1 OF 1

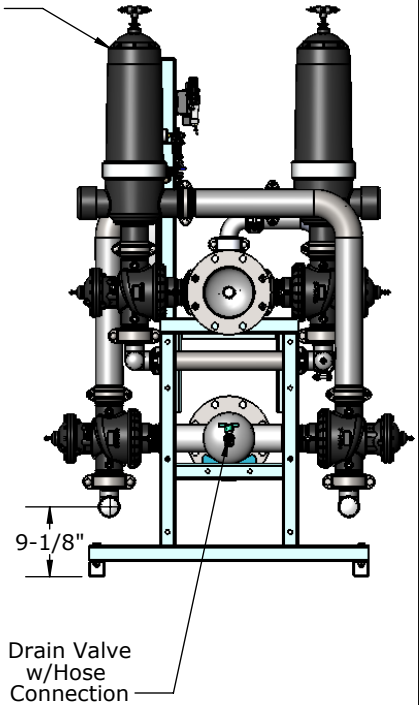
TITLE
Automatic Turbo-Disc
Filter Skid System
B1-ATD3(4)x4-130M-A











SYSTEM REQUIREMENTS
Electrical: 460VAC/3Phase/60Hz/4A
Air Supply: 2 CFM @ 80 - 100 PSI
Water Supply Pressure: 30-75 PSI
Water Flow Rate: 600 GPM Max
Dry Weight: 875 lbs

PRODUCT SPECIFICATION

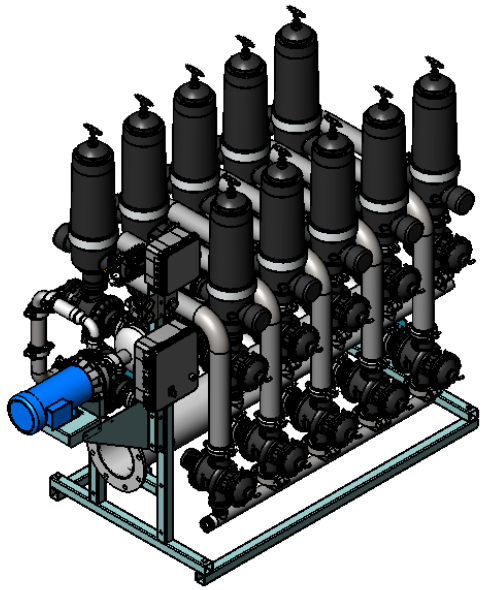
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

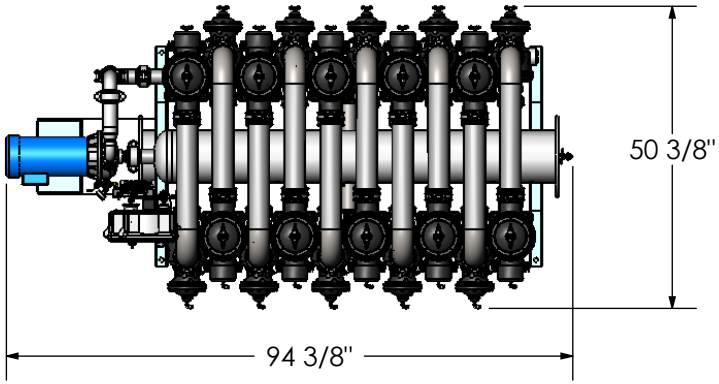
DRAWN	L.Brannan	10/21/10
CHECKED		
ENG APPR.		
MKT APPR.		

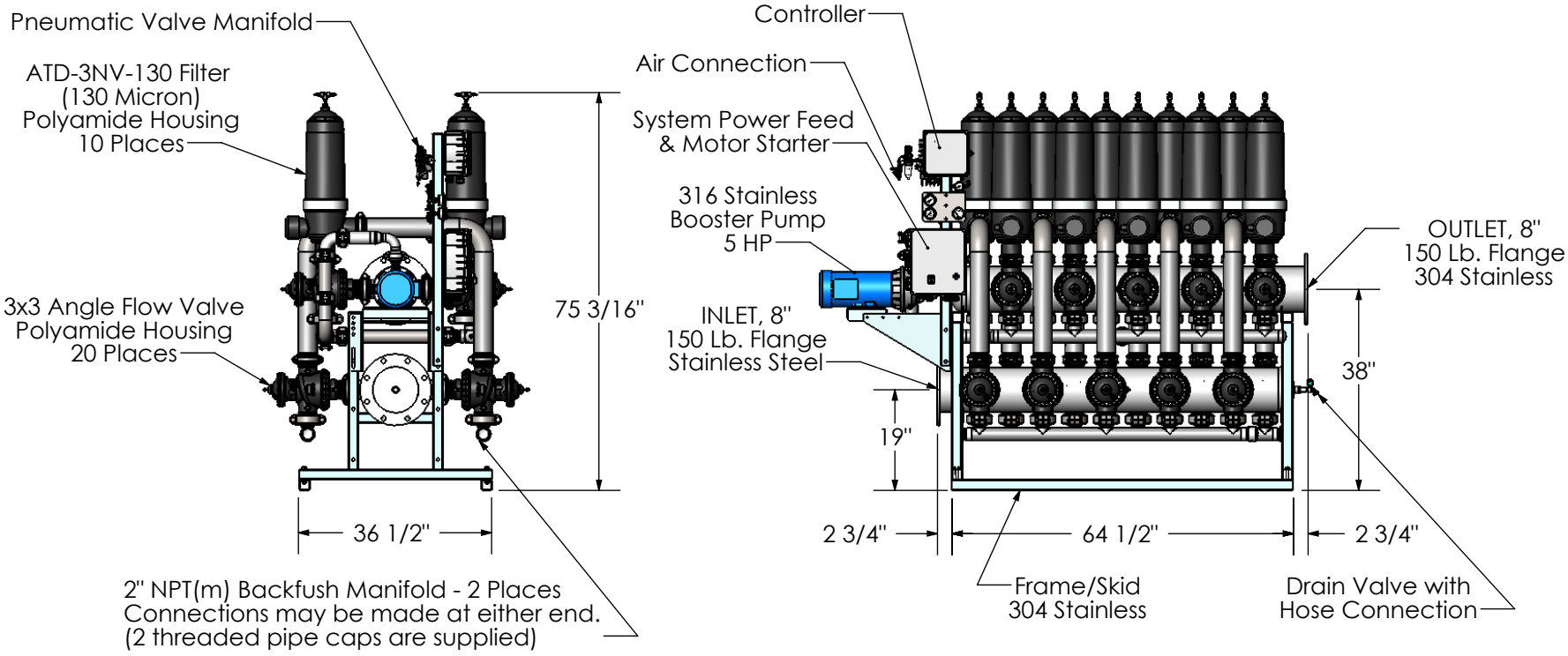
SHEET 1 OF 1

TITLE

Automatic Turbo-Disc
Filter Skid System
B1-ATD3(6)x6-130M-A







SYSTEM REQUIREMENTS

Electrical: 460VAC/3 Phase/60Hz/8A
Air Supply: 4 CFM@80-100 PSI
Water Supply Pressure: 30-75 PSI
Water Flow Rate: 100-800 GPM
Dry Weight: 1425 Lbs.

PRODUCT SPECIFICATION

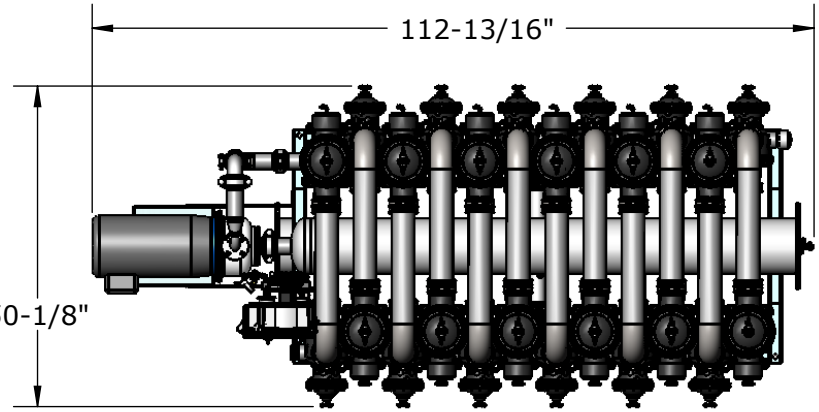
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

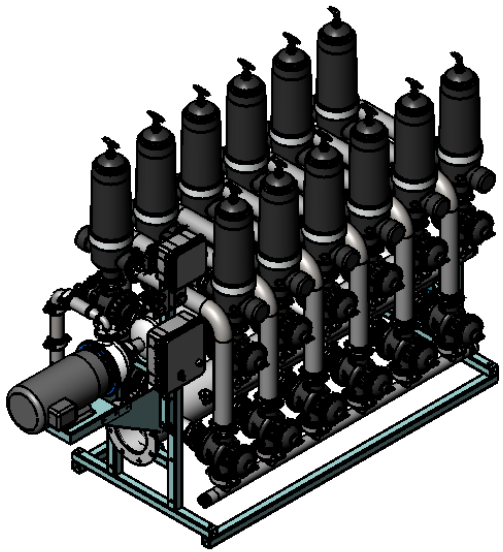
DRAWN	J. Larsen	1/10/11
CHECKED		
ENG APPR.		
MKT APPR.		

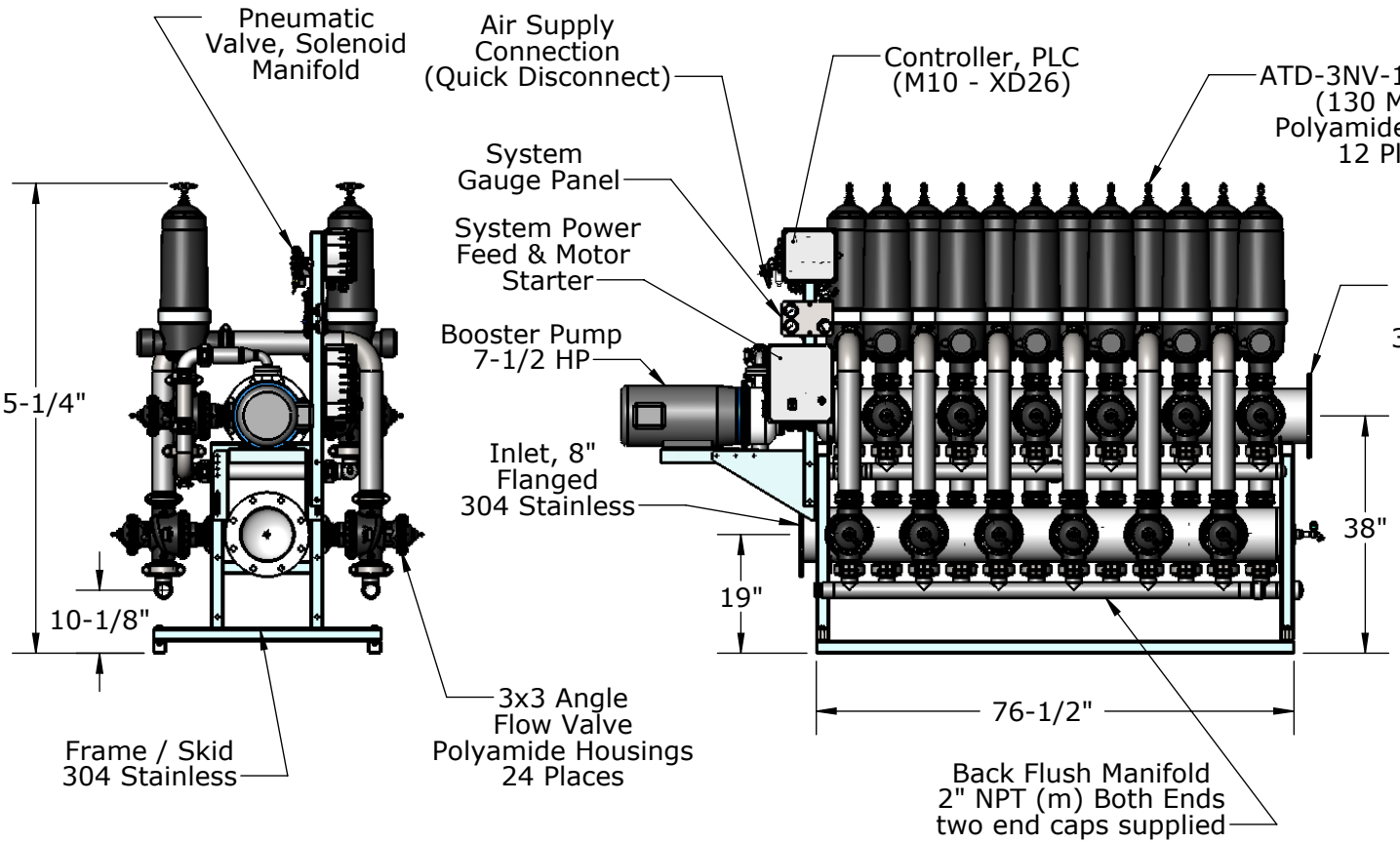
SHEET 1 OF 1

TITLE

Automatic Turbo-Disc
Filter Skid System
B2-ATD3(10)x8-130M-A







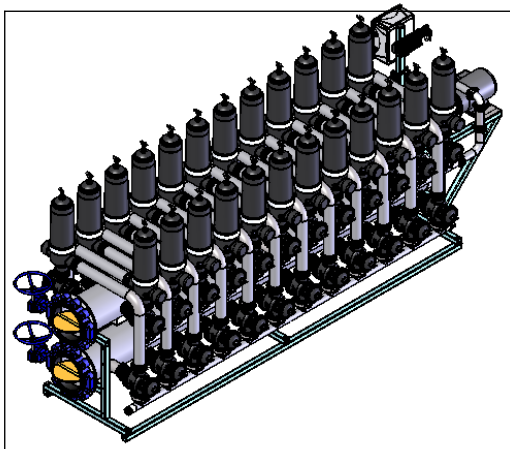
PRODUCT SPECIFICATION	DRAWN	L.Brannan	5/4/2011
	CHECKED		
	ENG APPR.		
	MKT APPR.		
	MLI File #	ML21063-12E	SHEET 1 OF 1

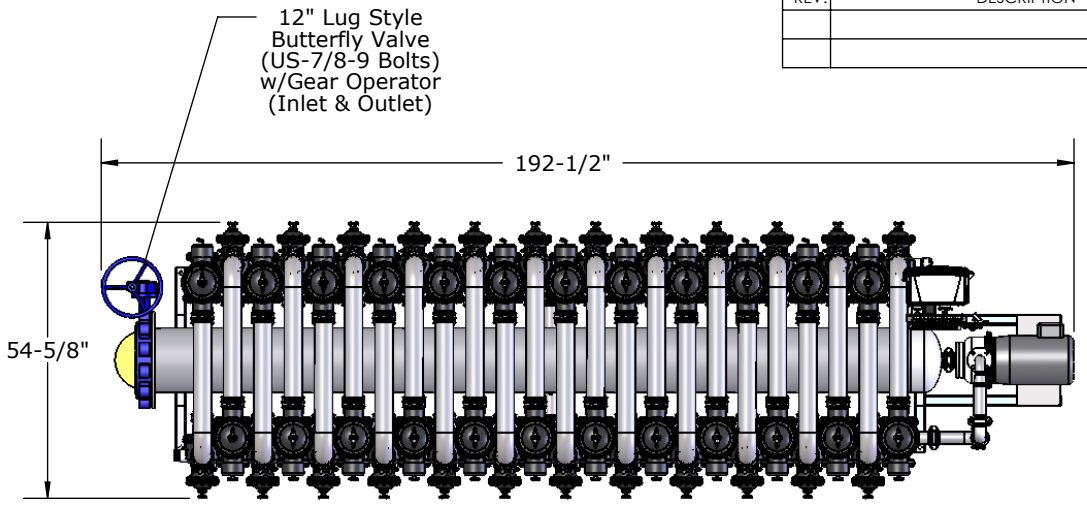
MILLER LEAMAN INC
800 Orange Ave. Daytona Beach FL 32114

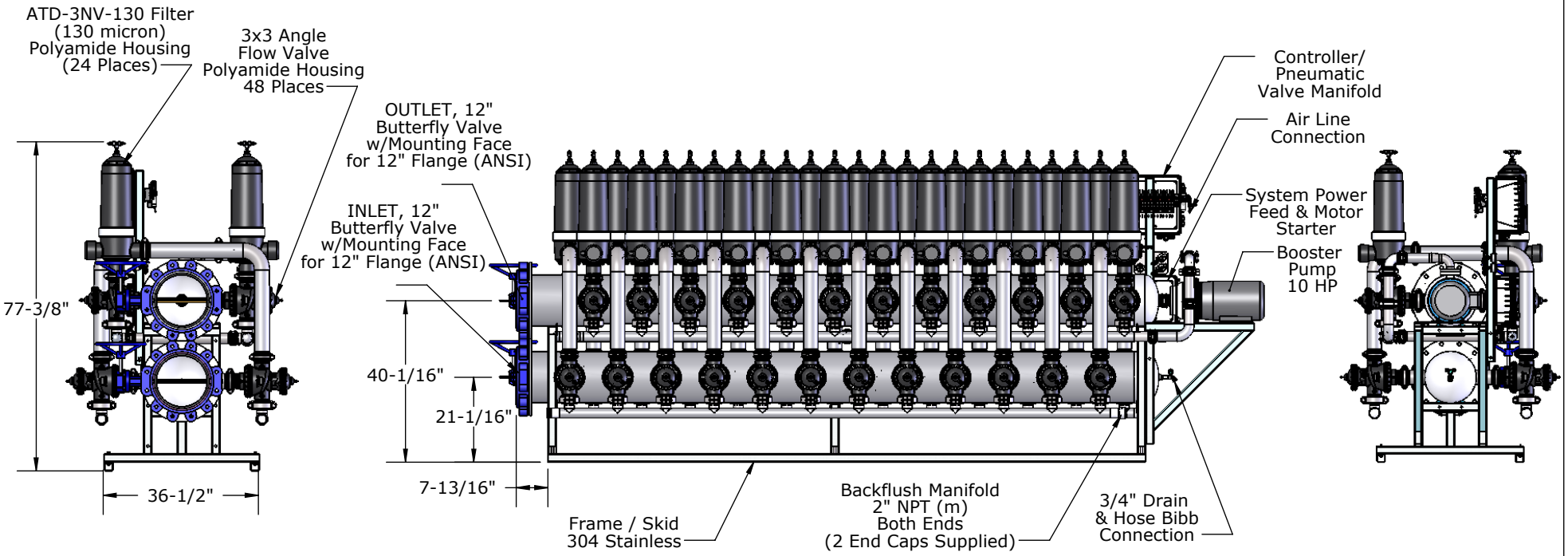
SYSTEM REQUIREMENTS:
Electrical: *460VAC/3Ph/60Hz/12A*
Air Supply: *4 CFM @ 80-100 PSI*
Water Supply @ Inlet: *10-30 PSI*
Flow Range: *1200 GPM Max*
Dry Weight: *1800 lbs*

TITLE:
Automatic Turbo-Disc Filter Skid System
B2H-ATD3(12)x8-130M-A

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED







SYSTEM REQUIREMENTS
Electrical: 415VAC/3Ph/50Hz/12A
Air Line: 4CFM@80-100PSI
(113-*lpm* @5.5-6.9 bar)
Water Pressure @ Inlet: 10-40 PSI
(.69-2.76 bar)
Flow Range: 1500 - 2400GPM
(5677- 9084-*lpm)*
Dry Weight: 3100 lbs (1406 kg)

PRODUCT SPECIFICATION

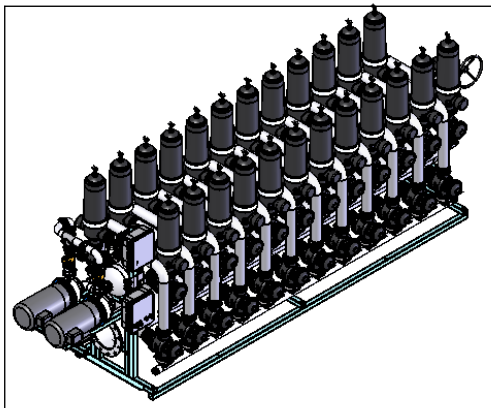
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

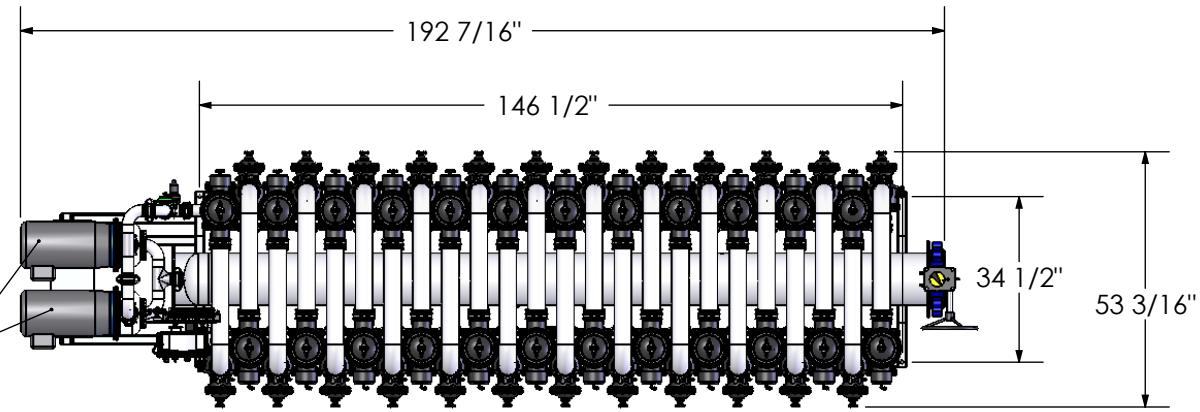
DRAWN	L.Brannan	3/17/10
CHECKED		
ENG APPR.		
MKT APPR.		

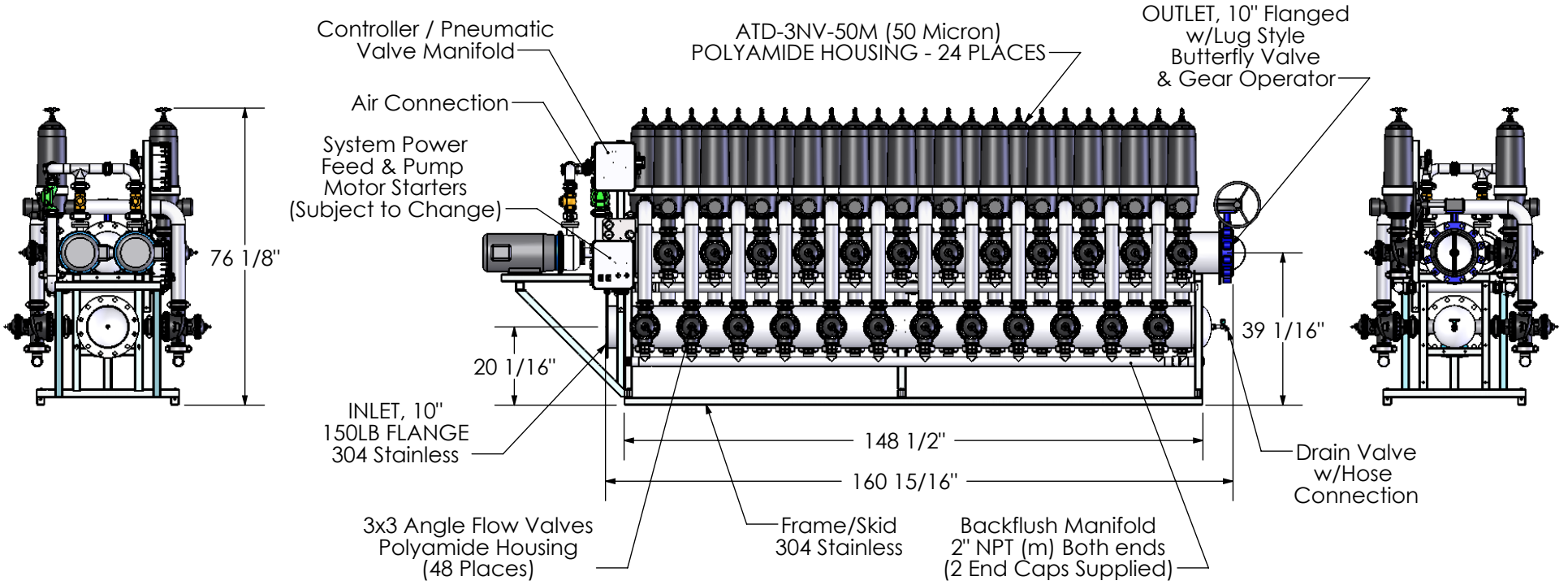
SHEET 1 OF 1

TITLE

Automatic Trubo-Disc
Filter Skid System
B2H-ATD3(24)x12-130M-A-MOD1







SYSTEM REQUIREMENTS
Electrical: 460VAC/3PH/60Hz/21A
Air Line: 4CFM @ 80-100 PSI
Water Pressure: 10-25 PSI @Filter Inlet
Water Flow Rate: 500-1500 GPM

PRODUCT SPECIFICATION

MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

DRAWN	L.Brannan	9/15/09
CHECKED		
ENG APPR.		
MKT APPR.		

SHEET 1 OF 1

TITLE
Automatic Turbo-Disc
Filter Skid System
2B2H-ATD3(24)x10-50M-A-MOD1

Turbo-Disc Filter
Owner's Manual & Addendums

AUTOMATIC DISC FILTER

OWNER'S MANUAL
OPERATION AND INSTRUCTION GUIDE

MILLER-LEAMAN, INC.
800 Orange Avenue / Daytona Beach, FL 32114
(386) 248-0500 / (386) 248-3033 FAX
Email: sales@millerleaman.com
Web Site: www.millerleaman.com

IMPORTANT

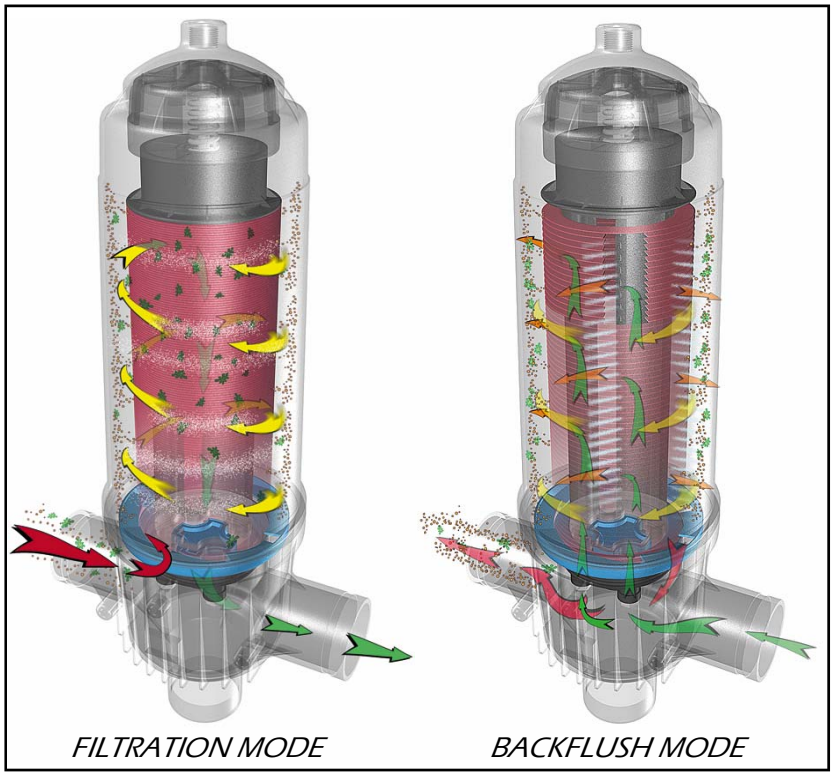
Please make certain that persons who are to use this filter thoroughly read and understand these instructions prior to operation. Should you have any questions regarding the operation of this filter, please call (386) 248-0500 and ask to speak with one of our customer service representatives, or email us at sales@millerleaman.com .

Record in the space below the Serial # of your unit. The Serial # is located on the data plate sticker on the face of the housing.

SERIAL # _____

I. INTRODUCTION TO TURBO-DISC AUTOMATIC FILTRATION

Thank you for your recent purchase of a *Turbo-Disc Automatic Filter System*. This manual will provide you with details concerning the function, design, and operation of your filter. Please read through this manual before installing and operating your filter. If you have any additional questions, please call our application specialists at 386-248-0500.



Disc Filtration — Utilizing stacks of compressed, grooved discs, disc filters capture debris not only on the surface of the disc stack, but throughout the depth of the grooved rings. Water is filtered from the outside of the disc stack to the inside.

Turbo-Disc Design — The design of the *Turbo-Disc* enables the efficient removal of debris from the water source while minimizing backflush frequency and backflush flow. Using the patent-pending *Turbo-Disc Element*, located at the base of the disc stack, the *Turbo-Disc* spins incoming water and debris as it enters the filter chamber (see *Filtration Mode* illustration to right). Heavy debris spins along the housing wall and make little contact with the disc stack. This spinning action enables the filter to run much longer between required backflushes.

When the filter element requires cleaning, a pressure differential sensor, within the filter controller, will engage the backflush cycle. During backflush, the disc stack is decompressed and the flow of water is reversed through the filter housing (see Backflush Mode illustration above right). During the backflush cycle, filtered water from the other filter pod(s) is used to sequentially to backflush one disc cartridge at a time. The filtered water comes back through the outlet of the filter, flowing up through four posts on the interior of the discs. These posts spray pressurized, clean, backflush water tangentially through the disc stack. The spray of water induces a high velocity spinning action, which rapidly cleans the entire disc stack. After the backflush cycle is completed, normal filtration resumes.

II. SAFETY CONSIDERATIONS

Safety precautions are essential when any filtration equipment is involved. These precautions are necessary when using, storing, and servicing your filter. If safety precautions are overlooked or ignored, personal injury or product damage may occur.

Your filter was designed for specific applications. It **should not** be modified and/or used for any application other than originally specified. If there are any questions regarding its application or installation, write or call Miller-Leaman, Inc.

ALWAYS OBSERVE THE FOLLOWING PRECAUTIONS:

1.) Read this manual carefully**.** Consider the applications, limitations, and the potential hazards specific to your filter.

2.) **Absolutely, under no conditions, should the filter pod cover or pressure gauges be removed while the filter is pressurized.**

3.) Units with damaged or missing parts should **never** be operated. Contact our customer service representatives for replacement parts.

4.) Pressure relief valves of a sufficient size and volume should be installed upstream of the inlet and downstream of the outlet of the filter. They should be set to relieve pressure at 1.2 times your maximum operating pressure (not to exceed the maximum rated pressure of 125 PSI). This will help to prevent damage to the filter housing and filter cartridge if severe stoppage or water hammer occurs.

5.) System design should ensure that back flow is avoided. If necessary, back flow prevention devices should be installed upstream of the inlet and downstream of the outlet to prevent back flow or vacuum effects due to pump shut-off or topographical differences. Installation of a check valve (right) also enables the filters to be maintained without draining your entire system.

6.) *This filter system is not freeze protected*. If the hydraulic water lines freeze, the unit will not backflush properly. If there is a risk of freezing, install indoors.

AT NO TIME SHOULD THE INTERNAL PRESSURE EXCEED THE MAXIMUM RATED PRESSURE FOR YOUR FILTER

III. TURBO-DISC FILTER SYSTEM COMPONENTS

A.) Filter Housing/Pod

The plastic filter pods between the 3-way valve and the outlet manifold. The pods are secured in place by "Grooved" clamps. The number of pods required is determined by the flow rate, the micron/mesh rating needed, and the water quality of your system. The pods contain the filter cartridge.

B.) Filter Cartridge

The heart of the Turbo-Disc Filter is the patent-pending filter cartridge. The filter cartridge is comprised of a vertical stack of grooved rings/discs and the frame that holds the discs in place. This frame also contains the *Turbo-Element*, disc cap, check valve, and backflush posts that enable automatic operation.

C.) 3-Way Backflush Valves

The 3-way valves are located between the filter housing and the inlet manifold. While in filtration mode, water passes from the inlet manifold, through the 3-way valves and into the filter housings. In backflush mode, the inlet opening is closed and the flush line is opened. Water then flows from the outlet manifold, through the filter cartridge and housing, then the 3-way valve and out the backflush line. The valve is controlled by the control panel and opens and closes using the systems air pressure. The valves are actuated by the solenoids mounted behind or near the controller.

D.) Backflush Controller / Control Panel

The control panel monitors your system's inlet and outlet pressure differential and controls the backflush cycle. It can also be set to backflush by time or manual override.

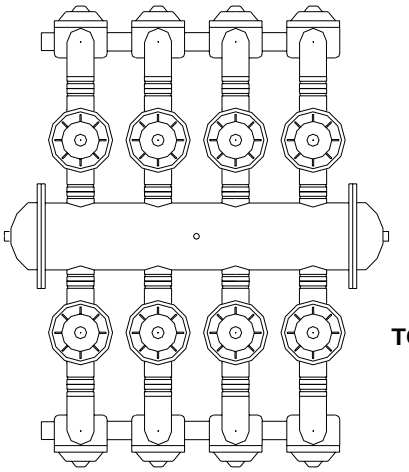
E.) Inlet and Outlet Manifold

The inlet and outlet manifold directs the flow of water to and from the filter housings. Provided manifolds are constructed of type 304 Stainless Steel. (Optional: 316 Stainless Steel, HD Polyethylene)

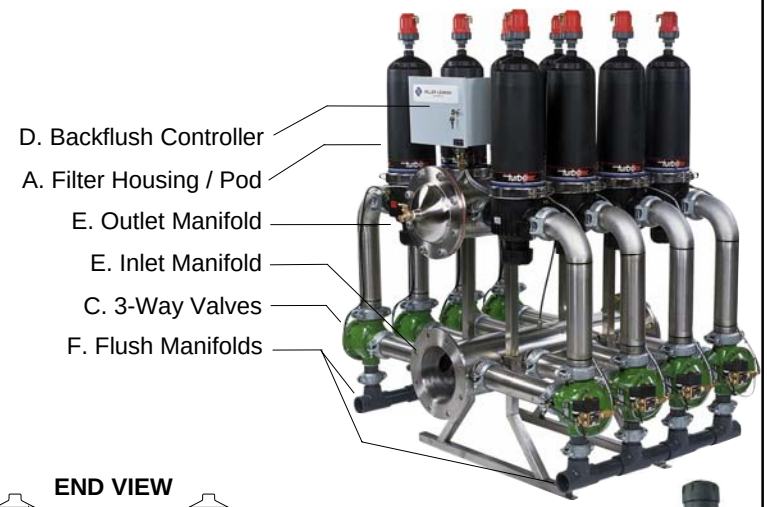
F.) Flush Manifold

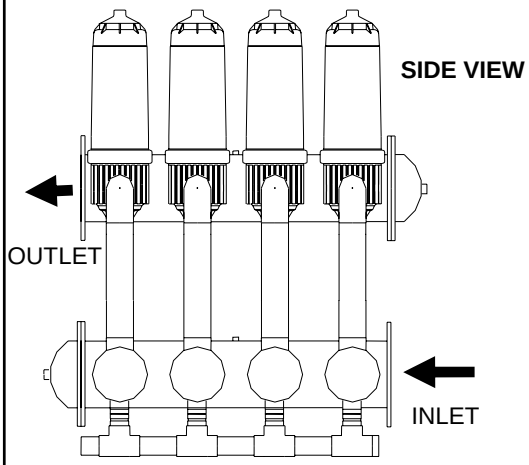
The flush manifold receives backflush water from the filter pod through the 3-way valve. The discharge for this manifold should always be to atmosphere pressure. **Never plumb the discharge against pressure or a vertical rise. This will seriously effect backflush performance.** The flush manifold is constructed of PVC or Stainless Steel.

Illustration C



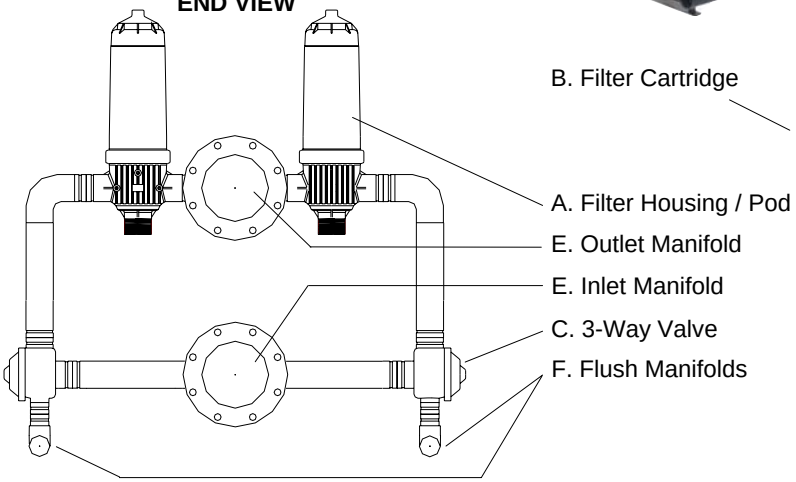
TOP VIEW





SIDE VIEW

END VIEW



IV. INSTALLATION GUIDELINES

There are a few tasks that must be accomplished before your *Turbo-Disc Filter System* is ready for operation. Please review the following checklist. When all tasks are complete the filter is ready to be used.

1.) The *Turbo-Disc Filter* requires 60 PSI downstream pressure to properly backflush. If downstream pressure is less than 60 PSI, a pressure sustaining valve (right) should be installed directly downstream of the filter outlet manifold or a booster pump could be installed off the outlet manifold. A pressure sustaining valve or booster pump is also recommended on high PPM applications and where the irrigated area is lower in elevation than the filter system. The sustaining valve or booster pump should be set to activate prior to and for the duration of the backflush cycle and should deactivate when not in backflush.

2.) Is your Turbo-Disc filter placed on a firm, supporting surface? Failure to do this may cause stress on the weld joints. Miller-Leaman recommends that a concrete pad be poured for the filter legs to rest on.

3.) Be sure that the inlet and outlet connections are securely fastened to your system piping The arrows on the housing clearly depict flow direction.

4.) Be sure that a quick pressure relief valve has been installed upstream of the inlet and downstream of the outlet of the filter, set to relieve pressure at 1.2 times your maximum operating pressure. This is to prevent damage to the filter if severe clogging or water hammer occurs. Pressure relief valves are available in various sizes, consult your local distributor or valve manufacturer to obtain the proper valve for your application.

5.) Be sure that cartridge covers are securely fastened and the band-clamps are securely latched.

V. CONTROLLER GUIDELINES

Once your filter has been installed, it is necessary to set the backflush controller. Please refer to the Maxim controller owner's manual for set-up instructions.

GENERAL INSTRUCTIONS:

Note your system's normal "when clean" pressure differential. Set the Pressure Differential switch-gauge 1-2 PSI higher than the normal clean differential. This is accomplished by rotating the silver arm in the switch-gauge to the desired setting. For example, if the "when clean" pressure differential is 4 PSI, set the switch-gauge to initiate the backflush cycle at 6 PSI. This will make certain that the when the filter is dirty enough to raise the system pressure differential to 6 PSI, that the backflush cycle will be initiated.

The backflush controller is equipped to engage a backflush cycle both on pressure differential and on a time interval basis or manual override. It is always recommended to set the controller to backflush not only on pressure differential, but on a backflush time interval as well. The time interval setting makes certain that the filter will perform a backflush cycle, over a pre-determined period of time, even if the system's pressure differential set point is not reached. This will ensure that the filter is protected even if the time interval is set too high for the water quality and if the pressure differential gauge fails. In heavy contamination applications, it is advisable to set the time interval to 1-2 hours, where in cleaner applications, the interval can be set to a longer period. As water conditions change, your time interval settings should change as well.

When beginning operation, make sure that the POWER switch in the face of the panel is in the ON position.

VI. PREVENTIVE MAINTENANCE

ROUTINE INSPECTION:

A.) Ensure that all backflush settings are as desired, that the controller is powered up, and that the controls are set for automatic operation.

B.) Check inlet and outlet pressures. Be sure that the pressure differential meets your controller settings. If not, check the controller's pressure differential switch-gauge for damage and initiate a manual backflush.

MONTHLY INSPECTION / MAINTENANCE:

A.) Initiate a manual backflush and observe all filters backflushing. Ensure that the backflush valves are all operating properly and initiating backflush.

B.) Open one or all pods to visually inspect the filter cartridges for visible damage and to ensure that all discs are being sufficiently cleaned.

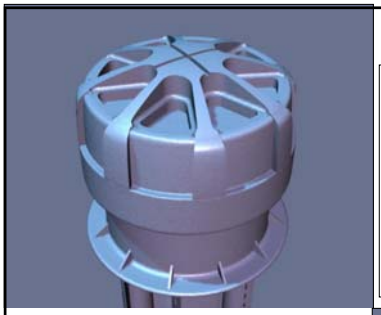
SEASONAL MAINTENANCE:

A.) Inspect the victaulic couplings for leaks. The victaulic gaskets should be lubricated with silicone gasket grease to prevent them from drying and cracking.

B.) The o-ring filer seal should be inspected and lubricated periodically. Remove the cartridge from the housing by gently rocking it back-and-forth and lifting it from the housing seat. Unscrew the top cap from the cartridge. Then remove the entire cap assembly by rocking the cap back-and-forth while lifting up on the cap assembly (see illustration). The o-ring seal will be in view after the cap is removed. Lubricate the o-ring seal with silicon lubricant (see illustration) and replace the disc cap assembly. Be sure to screw tight the top cap.

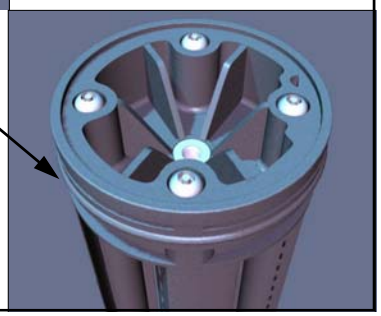
C.) Inspection and cleaning of mineral deposits on discs
Open all pods to visually inspect the filter cartridges for mineral residue in the disc surface or in the disc grooves. If a scale or mineral deposit film is present, remove the discs from the cartridge and dip the loosened discs into a chemical bath (follow above directions for removal of discs).

TIP: A common cleaning solution is 15% sulfuric acid. USE CAUTION WHEN HANDLING ACIDS/ CHEMICALS AND ALWAYS USE PROPER PROTECTIVE GLOVES, CLOTHING, AND GLASSES. Replace the discs on the cartridge.



Left: Disc Cap Assembly. Both the upper cap and the lower cap are removed to expose the o-ring and free the discs.

Right: The exposed inner disc cartridge. The o-ring seal should be properly cleaned and lubricated when re-assembling the cartridge.



VII. INFORMATION CONCERNING WATER HAMMER

WHAT IS WATER HAMMER?

Water hammer is a phenomenon that can occur in fluid systems with long pipes between the fluid source and the outlet. The term itself refers to the sound made when water hammer occurs which resembles banging a hammer on a long pipe. Water hammer is a rapid change of pressure caused by a rapid change in velocity. When the velocity is changed a pressure wave that travels at the speed of sound is initiated and travels in the upstream direction until it reaches some stationary energy level, like a reservoir. A rarefaction wave (at the pressure of the water source) then travels downstream at the same speed. If the flow has been shut off down-stream the pressure wave impacts the blockage and the pressure in the entire system is raised very quickly.

WHAT CAUSES WATER HAMMER?

Any action that can cause a rapid change in the velocity of the flow can set off a water hammer - closing a downstream valve, pipe fracture, pump stoppage, etc. The critical time for which a valve may be closed depends on the length of piping between the valve and the source reservoir. The longer the distance the slower the valve may be shut to cause a water hammer. Typically for short lengths of pipe (below 500 ft) the critical time is less than
1/10 second.

WHAT CAN WATER HAMMER DO?

Pressure spikes from water hammer can raise fluid pressures to very high values (in excess of 1000 PSI depending on the situation). Such pressure spikes can result in mechanical failures such as broken valves, pipes, filters, joints, etc. Water hammer does not have to occur fully to raise the pressure. A partial hammer can occur that raises the pressure to a certain percentage of the theoretical maximum. The *Turbo-Disc Filter* is rated to an absolute maximum pressure of 125 PSI. A water hammer pressure spike that raises the pressure higher than the maximum rated pressure may result in filter damage.

FAILURE TO FOLLOW INSTRUCTIONS AND WARNINGS CAN RESULT IN SERIOUS BODILY INJURY.

WHAT CAN I DO TO PREVENT WATER HAMMER?

There are precautions that can be taken to prevent or decrease the effect of water hammer. A pressure relief valve that leads to a surge tank or accumulator may protect other key components from water hammer. A close adherence to operational policies will also help prevent valves or pumps from being accidentally shut off thereby causing a water hammer. A close examination of a system will inform you where potential hazards are.

VIII. LIMITED WARRANTY

1) Duration:

One year from the date of purchase by the original purchaser: control panel / backflush controller, 3-way valves, solenoids, filter housing / pods, filter cartridge, manifold.

2) Who gives this warranty (Warrantor)

Miller-Leaman Incorporated / 800 Orange Avenue / Daytona Beach, FL 32114, (386) 248-0500.

3) Who receives this warranty (Purchaser):

The original purchaser (other than for purposes of resale) of the Miller-Leaman product.

4) What products are covered by this warranty:

Any Miller-Leaman *Turbo-Disc* housing and filter elements manufactured or sold by the warrantor.

5) What is covered under this warranty:

Defects on materials and workmanship, which occurs within the duration of the warranty period.

6) What is not covered under this warranty:

A) Implied warranties, including those of merchantability and fitness for a particular purpose, are limited to one year from the date of original purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

B) Any incidental, indirect, or consequential loss, damage, or expense that may result from any defect, failure, or malfunction of the Miller-Leaman product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

C) Any failure that results from an accident, purchaser's abuse, neglect, or failure to operate the products in accordance with the instructions provided in the owner's manual supplied with the product.

D) Items or service that are normally required to maintain the product, i.e. gaskets.

7) Responsibilities of warrantor under this warranty:

Repair or replace, at warrantor's option, products or components which have failed within the duration of the warranty period.

8) Responsibilities of purchaser under this warranty:

A) Deliver or ship the Miller-Leaman product to the Miller-Leaman manufacturing facility. Freight costs, if any, must be borne by the purchaser.

B) Use reasonable care in the operation and maintenance of the product as described in the owner's manual.

9) When the warrantor will perform repair or replacement under warranty.

A) Repair or replacement will be scheduled and serviced according to the normal workflow at the manufacturing facility, and depending on the availability of replacement parts.

B) If the purchaser does not receive satisfactory results from the product repair or replacement, the purchaser shall contact Miller-Leaman immediately.

<u>NOTE:</u> THIS WARRANTY IS VOID IN THE EVENT THE PURCHASER FAILS TO COMPLY WITH ANY ONE OF THE REQUIREMENTS FOR INSTALLATION AND USE OUTLINED OR SET FORTH IN THIS MANUAL AND MILLER-LEAMAN INCORPORATED ASSUMES NO LIABILITY WHATSOEVER.

This Limited Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

MILLER-LEAMAN
INCORPORATED

MILLER-LEAMAN, INC.

800 Orange Avenue, Daytona Beach, FL 32114
Phone: (386) 248-0500 / Fax: (386) 248-3033
www.millerleaman.com
email: sales@millerleaman.com
Hours: M-F 8:00 AM - 5:00 PM Eastern USA

Automatic Turbo-Disc Single Pod Air-Assist (SPAA)

Addendum to Owner's Manual

Please refer to the *Automatic Disc Filter Owner's Manual* for an introduction to disc filtration and for a basic operation and instruction guide.

I. Introduction to the Automatic Turbo-Disc Air-Assist System

In an effort to employ the Turbo-Disc filters in a wide range of applications it has been determined that by increasing the backpressure (as high as 100 PSI), the cleaning process is more efficient and the backwash duration decreases substantially resulting in less backwash water. This was the motivation to develop the automatic ***Turbo-Disc Booster Systems*** and the ***Turbo-Disc Air Assist Systems.***

The standard automatic Turbo-Disc (ATD) systems typically use water being filtered by the system to backwash the filter. The air-assist systems are equipped with an air accumulator tank and a water reservoir. When the system goes into backwash mode the pressurized air and the water stored in the reservoir combine to create a powerful, high-pressure backwash through the discs. This eliminates the need for an external water source and guarantees the most efficient cleaning.

II. Air Assist Component Parts

A) 2" Automatic *Turbo-Disc* Filter

B) Water Reservoir - The water reservoir is a Turbo-Disc filter housing with minor modifications. This housing is in line with the ATD filter and fills with "clean" or filtered water to be used for backwash.

C) Air Accumulator Tank - The air tank is a 9.8-gallon mild steel tank. This tank stores air that is supplied to the system to actuate the backwash valves and to boost the backwash process. The system (and tank) must never exceed 125 PSI but it is recommended that ~100 PSI be maintained in the tank for the most effective backwash.

D) Centrifugal Pump - 460VAC, 3 Phase, TEFC, 1.5HP (70 GPM @ 25 PSI). The standard SPAA can operate between 40-70 GPM. Single phase and various voltages are available.

E) 2" PVC gate valve - Throttle valve at start-up until system pressure reads desired pressure. See pump curve for pressure/flow performance curves.

F) Air Injection Valve - The air injection valve controls the air from the air tank passing through the water reservoir during the backwash cycle. This valve is normally closed.

G) Air Solenoid - Actuates the backwash valves and supplies the air-override system. Solenoids are equipped with a manual override lever. Turn red lever clockwise to actuate manually.

H) Air Vent Solenoid - This solenoid is mounted to the 2x2 backwash valve port that is connected to the drain port. It is automatically energized for ~15 seconds after each backwash cycle to vent air from the water reservoir allowing it to fill with filtered water.

I) Maxim 4 Controller - Preprogrammed by Miller-Leaman, Inc. Backwash can be initiated by pressure differential, timer (4 hr factory setting) or manually activated within the controller. The controller operates on 120VAC. ***See attached instructions for controller operation***.

J) Pressure Differential (PD) Switchgauge - Adjusted by turning the knob on the face of the gauge. PD should be set for approximately 1-2 PSI greater than the operating PD. The PD has a 5 second delay before triggering a backwash.

K) Air Compressor - The compressor is an option to the single pod air-assist system. When the air compressor accompanies the single pod air-assist system it is not mounted to the frame. All necessary connections are included for easy hook-up. The compressor operates on 120 VAC.

L) Air Pressure Regulator - The air regulator is located on the inlet port of the air accumulator tank. This insures that the tank pressure does not exceed 125 PSI.

M) Motor Starter box - Starter must be hard wired to 460 VAC. Other voltages (575, 230, 208, 120) are available.

III. Installation

A) Mechanical Connections

i. Pump Suction: The pipe size that supplies the pump suction should be at least 2" pipe for a 1 ½" pump suction as recommended by the pump manufacturer. Please verify that the pump suction connections meet the requirements as listed in the Pump Owner's Manual.

ii. System Discharge: The 2" PVC gate valve at the discharge of the system must be throttled until the system pressure is the same as the design pressure. ***See pump performance curve for flow and pressure. Running the pump without backpressure will cause the pump to overload***.

iii. Backwash/Drain: The 2" (male) NPT drain line should be plumbed to drain to atmosphere. If there is a restriction in this drain line it will prevent the filters from cleaning properly. Do not reduce the drain size below 2" pipe. ***The discharge pipe must be securely mounted***.

B) Electrical Connections

i. Motor Starter: The motor starter must be hard wired for 460VAC, 3 Phase.

ii. Controller: 120 VAC, 1 AMP, standard 3-prong plug

iii. Compressor (optional): 120 VAC, 15 AMP, standard 3-prong plug (if applicable)

C) Controller Settings

i. Power On: The power switch/circuit breaker is located on the front of the controller inside the enclosure. **See *MAXIM* controller attachment for operating details**.

ii. Controller Actuation: The controller can be set to actuate by backflush various methods, individually or simultaneously.

1. Periodic: The time interval between backwashes is set per application requirements.
2. Manual: Manually turning on the backflush cycle from the Status screen controller menu (see *MAXIM* controller manual).
3. Pressure Differential: The pressure differential gauge must be set to the desired differential. It is recommended to start with approximately 1-2 PSI higher than the "when clean" differential.

IV. Start Up

A) Prime the Pump: A pump is primed when all the air in the suction line and pump volute has been evacuated and replaced with water.

B) Impeller Rotation: At initial start up it is critical to verify that the impeller is rotating in the correct direction. When looking at the fan from the back of the motor the blades should rotate in the clockwise direction. If it is not then two of the three power lines (3 phase) wired into the starter must be switched. If the flow and pressure are achieved according to the pump performance curve then the impeller rotation direction is correct.

C) Air pressure: A standard ¼" male air fitting is located on the regulator assembly on the front port of the air tank. 80-120 PSI is required.

D) Throttle Discharge Valve: As stated earlier, the discharge is fitted with a throttling gate valve. This gate valve must be throttled until the pump discharge pressure is at the operating pressure as determined by the pump performance curve. Do not leave valve wide open. This will result in an overloaded of the pump.

E) Controller Settings: It is recommended to manually initiate several backwash cycles to insure proper set up and to become familiar with the system.

V. Sequence of Operation Events

A) Filtration Mode: Water is supplied to the system at the design flow rate not to exceed 70 GPM and at a pressure not to exceed 125 PSI. The 2" PVC gate valve at the discharge of the system must be throttled until the system pressure is the same as the design pressure.

Note - See the pump performance curve for flow and pressure . Running the pump without backpressure will cause the pump to overload.

As the filter produces "clean" water the water reservoir fills with the filtered water.

B) Backwash Mode: Backwash is initiated by pressure differential, timer or manually. The (2) backwash valves are actuated a second before the air injection valve. This isolates the pump and discharge from the filter for the duration of the backwash. During this time the pump is running at the shut-off head. The stored air and "clean" water are forced through the filter cartridge in reverse causing the debris to exit via the backwash drain. Once filtration is resumed the individual brass solenoid is energized for ~15 seconds allowing the water reservoir to vent the trapped air and fill with "clean" water.

If you have any questions or need assistance with any part of the installation or operation please call 800-881-0320.

Automatic Turbo-Disc Side Stream Skid System
Addendum to Owner's Manual

Please refer to the *Automatic Disc Filter Owner's Manual* for an introduction to disc filtration and for a basic operation and instruction guide.

I. Introduction to the Automatic Turbo-Disc (ATD) Side Stream Skid Systems

The Automatic Turbo-Disc Side Stream Skid System is a complete package of filters, valves, pumps, solenoids and controllers mounted on a stainless steel frame that can easily be installed to filter water from a reservoir or sump typically not under pressure.

II. ATD Side Stream Skid System Component Parts

A) 2" or 3" Automatic *Turbo-Disc* Filter
B) Bermad 350-2x2, 350-3x2, or 350-3x3 Backwash Valves (Air actuated)
C) Centrifugal Pump
D) Bermad 410 Flow Control Valve w/ Mechanical Throttling Stem
or Manual butterfly throttling valve
E) Inlet/Outlet Manifolds-Sch.10 304 Stainless Steel Pipe
F) Backwash Manifolds-2" Sch. 80 PVC or 2" Sch. 10 304 Stainless Steel w/ 2" (male) NPT connections.
G) Maxim Controller- Electric backwash controller actuates the backwash cycle by Pressure Differential, Timer or Manual actuation and operates on 110 VAC @ 1 AMP.
H) Pressure Differential (PD) Switchgauge-Adjusted by turning the knob on the face of the gauge. PD should be set for approximately 1-2 PSI greater than the operating PD when the filters are clean. PD has a 5 second delay before triggering a backwash.
I) Air Pressure Regulator-The air regulator is mounted on the solenoid manifold assembly and regulates the air pressure that is applied to the top of the filter pods during the backwash cycle.
J) Air-Override Check Valve Assembly is assembled to the top of each filter pod to allow regulated air to be applied to the pod during backwash.
K) Motor Starter with overload protection and reset button

III. Installation

A) Mechanical Connections
i. *Inlet Flanged Connection*-The pump suction flange must be plumbed according to the recommendations of the pump manufacture. The instructions can be found on pages 6-10 of the Berkeley Owner's Manual. It is very critical that these installation instructions are followed. Please note that the pump suction piping does directly affect the performance of the pump.
ii. *Outlet Flanged Connection*-The discharge plumbing should be no smaller than the discharge pipe size. A reduction in the discharge pipe will cause a restriction to the flow and affect the performance of the pump.
iii. *Backwash/Drain*: The 2" (male) NPT drain line should be plumbed to drain to atmosphere. If there is a restriction in this drain line it will prevent

the filters from flushing properly. Do not reduce the drain size below 2" pipe.

B) Electrical Connections
   i. Pump Motor Starter- 460 VAC, 3 Phase, Hard Wire (standard)
   ii. Compressor: 110 VAC, 14.5 AMP, standard 3-prong plug (optional)

C) Controller Settings
   i. Power On: The power switch/circuit breaker is located on the front of the controller inside the enclosure. **See *MAXIM* controller attachment for operating details**.
   ii. Controller Actuation: The controller can be set to actuate by various methods, individually or simultaneously.
      a. Periodic: The time interval between backwashes is set per application requirements.
      b. Manual: Manually turning on the cycle within the controller menu (see MAXIM control manual).
      c. Pressure Differential: The pressure differential gauge must be set to the desired differential. It is recommended to start with approximately 1-2 PSI higher than the "when clean" differential.
   iii. Dwell: The dwell setting is to control the duration of time between stations.
   iv. Counter Reset: This allows the user to reset the backwash count to zero.

IV. Start Up

A) Prime the Pump: A pump is primed when all the air in the suction line and pump volute has been evacuated and replaced with water. See page 15 of the Berkeley Pump Owner's Manual for directions about priming the pump.

B) Impeller Rotation: At initial start up it is critical to verify that the impeller is rotating in the correct direction. When looking at the suction of the pump the impeller should be rotating counter clockwise. If it is not then two of the three power lines wired into the starter must be switched. If the flow and pressure are achieved according to the pump performance curve then the direction is correct.

C) Air pressure: A standard ¼" male air fitting is located on the solenoid assembly for easy air hook-up. There is also an air regulator set to 15-30 PSI. This air is applied to the tops of the filter pods during backwash. It is important to the efficiency of the backwash that this air is present but must be regulated. Full air pressure is used to actuate the valves only.

D) Controller Settings: It is recommended that the operator manually cycle through several backwash cycles to insure proper set up and to become familiar with the system. This will help determine what settings (periodic, pressure differential) are needed for your system.

V. System Operation Modes

A) Filtration Mode: Water is supplied to the system at the design flow rate and pressure. The design conditions are achieved by throttling the discharge valve (most non-booster ATD skid systems have a green Bermad flow control valve with a mechanical throttling stem for throttling the flow to achieve the appropriate pressure) until the system pressure is the same as the design pressure. **See the pump performance curve for flow and pressure**. **Running the pump without backpressure will cause the pump to overload**.

B) Backwash Mode: Backwash is initiated by pressure differential, timer or manually via an electric controller. When the controller is energized to start a backwash cycle all the filters will consecutively backwash one filter at a time. (Some systems are sized to backwash two filters at a time). If the system is equipped with a Bermad 410 flow control valve then the valve will close completely during backwash to generate as much pressure as the pump will allow. If the system is equipped with a Bermad 430 flow control valve then the valve will only actuate partially to generate adequate pressure but the pressure is regulated with a pilot valve that is mounted to the flow control valve. The ATD systems have a maximum pressure rating of 125 PSI.

If you have any questions or need assistance with any part of the installation or operation please call 800-881-0320.

Automatic Turbo-Disc Booster System
Addendum to Owner's Manual

Please refer to the *Automatic Disc Filter Owner's Manual* for an introduction to disc filtration and for a basic operation and instruction guide.

I. Introduction to the Automatic Turbo-Disc Booster System

In an effort to employ the Turbo-Disc filters in a wide range of applications it has been determined that by increasing the backpressure (as high as 100 PSI), the cleaning process is more efficient and the backwash duration decreases substantially resulting in less backwash water. This was the motivation to develop the automatic ***Turbo-Disc Booster Systems*** and the ***Turbo-Disc Air Assist Systems.***

The booster systems are equipped with a booster pump that draws filtered water from the outlet manifold and directs it through the booster manifolds to backwash the filters. The advantage of this type of system is to produce adequate pressure for the backwash cycle with a relatively small pump that only operates for short periods of time. The booster pump is sized according to the conditions of the main system, primarily the flow and pressure that are supplied to the filter system.

II. Booster System Component Parts

A) 2" or 3" Automatic *Turbo-Disc* Filters
B) Bermad 350-2x2 or 350-3x3 Backwash Valves (Air actuated)
C) Centrifugal Pump (Booster)
D) Centrifugal (Full-flow) Pump (if applicable)
E) Inlet/Outlet Manifolds- Sch. 10 304 stainless steel manifolds, 304 SS Flanges, Sch.10 pipe caps and 2" or 3" Sch.10 inlet/outlet pipe stubs.
F) Backwash Manifolds-2" Sch.10 304 stainless steel manifolds w/ 2" (male) NPT connections.
G) Booster Manifolds-2" S10 T304 stainless steel manifolds
H) Burkert 5470 Solenoid Manifold- Solenoids are equipped with a manual override lever. Turn red lever clockwise to actuate manually. Turn counterclockwise to resume normal operation.
I) MAXIM Backflush Controller- 4, 8 or 12 Station electric backwash controller actuates the backwash cycle by PD, Timer or Manual actuation and operates on 110 VAC/24VDC/12VDC.
J) Pressure Differential (PD) Switchgauge-Adjusted by turning the knob on the face of the gauge. PD should be set for approximately 1-2 PSI greater than the operating PD. PD has a 15 second delay before triggering a backwash.
K) Air Override Regulator-The air regulator is mounted above the solenoid manifold assembly and regulates the air pressure that is applied to the top of the filter pods during the backwash cycle.
L) Air-Override Check Valve Assembly is assembled to the top of each filter pod to allow air to be inserted into the pod during backwash. This air is regulated air.
M) Motor Starter- 460 VAC that must be hard wired to the system during installation.

III. Installation

A) Mechanical Connections
   i. Inlet: Flange
   ii. System Discharge: Flange
   iii. Backwash/Drain: The 2" (male) NPT drain line should be plumbed to drain to atmosphere. If there is a restriction in this drain line it will prevent the filters from flushing properly. Do not reduce the drain size below 2" pipe.

B) Electrical Connections
   i. Pump Motor Starter: Hard-wired for 460 VAC (standard). The booster pump motor starter must be in the "AUTO" position when the filter is in operation.
   ii. Compressor: 110 VAC, 14.5 AMP, standard 3-prong plug (optional)

C) Controller Settings
   i. Power On: The power switch/circuit breaker is located on the front of the controller inside the enclosure. **See *MAXIM* controller attachment for operating details**.
   ii. Controller Actuation: The controller can be set to actuate by various methods, individually or simultaneously.
      a. Periodic: The time interval between backwashes is set per application requirements.
      b. Manual: Manually turning on the cycle within the controller menu (see MAXIM control manual).
      c. Pressure Differential: The pressure differential gauge must be set to the desired differential. It is recommended to start with approximately 1-2 PSI higher than the "when clean" differential.
   iii. Dwell: The dwell setting is to control the duration of time between stations.
   iv. Counter Reset: This allows the user to reset the backwash count to zero.

D) Air Requirements: Typically ATD filter systems include the air override feature and the valves are pneumatically actuated.
   i. 80-120 PSI @ 4CFM is the required air pressure and volume.
   ii. The air connection is a standard ¼" male air connector.

IV. Start Up

A) Prime the Pump: A pump is primed when all the air in the suction line and pump volute has been evacuated and replaced with water. If the main flow pump does not have a flooded suction then a foot valve is required to maintain a prime after shutoff.

B) Impeller Rotation: At initial start up it is critical to verify that the impeller is rotating in the correct direction. When looking at the suction of the pump the impeller should be rotating counter clockwise. When looking at the fan from the back of the motor, the blades should rotate in the clockwise direction. If it is not then two of the three power lines (3 phase) wired into the starter must be switched. If the flow and pressure are achieved according to the pump performance curve then the direction is correct.

C) Air pressure: If the unit is not equipped with an air compressor a standard ¼" male air fitting is located on the solenoid/regulator assembly for easy air hook-up.

D) Controller Settings: It is recommended that the operator manually cycle through several backwash cycles to insure proper set up and to become familiar with the system. This will help determine what settings (periodic, pressure differential) are needed for your system.

V. System Modes

A) Filtration Mode

B) Backwash Mode: Backwash is initiated by pressure differential, timer or manually via an electric controller. When the controller is energized to start a backwash cycle all the filters will consecutively backwash one or two filters at a time. The booster pump is actuated by a relay that is wired to the master switch on the controller so it will automatically run when the controller initiates a backwash cycle.

If you have any questions or need assistance with any part of the installation or operation please call 800-881-0320.

MAXIM Controller
Information & Owner's Manual

MAXIM controller

A PRODUCT OF MILLER-LEAMAN, INC

The ***MAXIM*** is a state-of-the-art backflush controller designed for automatic filtration systems. Components are UL and CE approved and are protected by a robust, corrosion-proof NEMA 4X watertight enclosure.

The heart of the ***MAXIM*** is a programmable micro-PLC, custom designed to maximize the performance of your filtration system. The ***MAXIM*** has a user-friendly, menu driven control panel that enables adjustment of all critical automatic filter functions. The illuminated LCD displays real-time system status. The memory module (EEPROM) allows for installation of system upgrades and provides the ability to upload custom application specific programs without the need for a computer.

*Each **MAXIM** controller comes ready to install with a stainless steel, mounted, differential pressure switch-gauge, enclosure mounting brackets and a standard 6 foot outdoor cord with a NEMA 5-15 120 VAC plug. The **MAXIM** includes a water-resistant electrical entry fitting and user-friendly quick-connect wiring points for simple installation without the need for tools. Each unit is factory tested and includes a detailed owner's manual.*

LCD Function Display Screen

Adjustment & Activation Keys

Menu Scrolling Buttons

MILLER LEAMAN INC

MAXIM
A PRODUCT OF MILLER-LEAMAN, INC
controller

MAXIM Functions and Capabilities

- User-friendly menu screens to control all functions including pre-dwell time, backflush time, dwell time, differential pressure set-point and number of filter stations
- Real-Time system status on illuminated LCD display
- Elapsed time since last backflush display
- NEMA-4X, corrosion-proof enclosure with lockout capabilities
- Simple installation; input & ouput (I/O) connections are clearly labeled
- Components are UL and CE approved
- Power supply with auto-resetting surge suppression device
- Memory chip (EEPROM) for easy system upgrades
- ?Standard configuration includes up to 10 output stations with individual common ground locations for each output; 16 outputs optional on special order
- Quick connect wiring points require no tools for making connections and hold wires securely in place
- Optional pressure transducer input locations with pressure differential read-out on LCD display
- 120 VAC power plug standard; Optional input power: 100 to 240 VAC, 50 or 60 Hz, 12 VDC, 24 VDC or 24 VAC
- Output voltages available in 120 VAC, 12 VDC, 24 VDC or 24 VAC
- Custom, application specific programs available upon request
- Each ***MAXIM*** ships factory tested with an individual serial number to track each system's components and software

Model	Total Outputs	Total Inputs	Output Voltages	Dimensions (inches)
MAXIM 4	4*	8	12 VDC, 24 VDC, 24 VAC, 110 VAC	8x8x4
MAXIM 8	8*	12	12 VDC, 24 VDC, 24 VAC, 110 VAC	8x8x4
MAXIM 10	10*	16	12 VDC, 24 VDC, 24 VAC, 110 VAC	8x8x4

** 2 amps maximum current draw standard. Optional larger power supply available for higher amp requirements.*

MILLER LEAMAN INC

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A PRODUCT OF MILLER-LEAMAN, INC

State-of-the-art filter backflush controller

OWNER'S MANUAL

For the TurboDisc Air Assist Product Line

Introduction

Thank you for purchasing the *MAXIM*, a state-of-the-art backwash controller designed for automatic filtration systems. The heart of the *MAXIM* is a programmable micro PLC, custom designed to maximize the performance of your filtration system. These components are protected by a robust, corrosion-proof watertight enclosure. The *MAXIM* has a user-friendly, menu driven controller that gives the user control of all critical automatic filter functions. The backlit LCD display provides real-time system status. The memory module (EEPROM) allows for installation of system upgrades and provides the ability to download custom, application specific programs without the need for a computer. Please read this manual prior to installation and retain it for future reference.

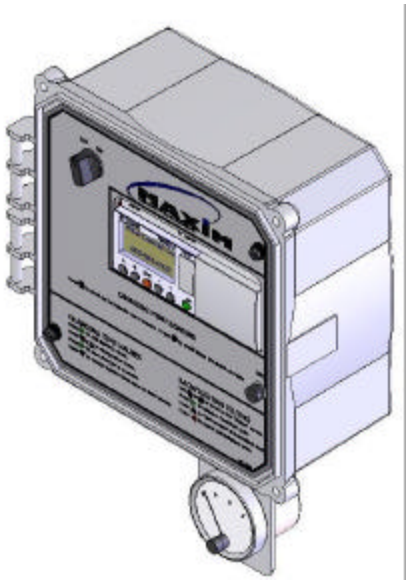
Contents

Installation

Some *MAXIM* controllers are pre-installed as a component of a complete filtration system while others come as a stand-alone unit. Follow the directions below only if it is necessary to connect the electrical or gauge connections.

Electrical Connections:

If the Maxim controller is not pre-wired as part of an automatic filter system, then it will be necessary to mount the controller on a flat surface using the mounting brackets provided. It will also be necessary to connect each filter station to a corresponding *Output (+)* and *Common (-)* terminal on the circuit board. Review the *Electrical Detail* section prior to making any connections to the controller. If requested custom input/output capabilities are not described in this manual, please refer to an attached addendum.



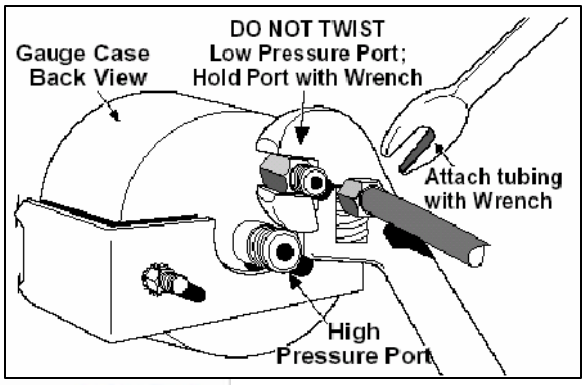
Differential Pressure Gauge Connections:

Connect the pressure differential (PD) gauge to the system's inlet (high) and outlet (low) pressure ports.

WARNING: Failure to use a second wrench on the low pressure port when tightening fittings may result in damage to the internal pressure tubing.

Be sure all connection tubing is clean prior to installation on the gauge. The gauge contains orifices that may become clogged by larger particles.

CAUTION: Make sure not to foul the pressure orifices with pipe dope or dirt, as the gauge will not operate.



Differential Pressure Gauge Set-point:

Adjust the contact to the desired PD set-point that will trigger a backflush cycle. The differential pressure switch-gauge contact should be set at the filter's recommended setting. Reference the filter manufacturer's owner's manual for the recommended PSID setting.

Electrical Detail

The circuit board layout shown applies to the M4, M8, and M10 controllers. The M_ in the serial number on the left side of the enclosure designates the controller's total number of outputs. For example, a MLI-M8-xxxxx has 8 available outputs (uses outputs 1-8 only, leaving outputs 9 and 10 unused). Review the connection details below before wiring to the controller.

CAUTION: Unplug controller from power source before removing cover!

A. Power supply connections:

- *115VAC Power In* provides power to the transformer. The standard controller comes equipped with a 115VAC wall outlet plug. 115VAC can be hard-wired into these connections if preferred.
- *12VDC/24VDC/24VAC Power In* provides power to the controller and circuit board connections. This power is typically provided from the transformer. If 115VAC power is not available for the transformer, low voltage power can be provided directly into these connections (make sure to remove and cap any existing transformer wires). The provided power must match the controller's operating voltage (indicated directly above the LCD screen).

Note: The standard transformer provides a maximum total power output as listed below. Exceeding the maximum available power may trip the fuse repeatedly or overload the transformer. The fuse is an automatic resetting type and will reset itself within a few seconds of being tripped.

Maximum power available: 12VDC or 24VDC - 24 Watts; 24VAC - 48 Watts

B. Outputs:

The outputs provide a voltage output (same as controller's voltage) to control the backflush valves, booster pump, solenoids, pressure sustaining valve, air override, etc. The last output is typically a *master output*, which remains on during the entire backflush cycle.

Note: Any *Common (-)* connection may be used for the common/negative terminals of the solenoids/valves.

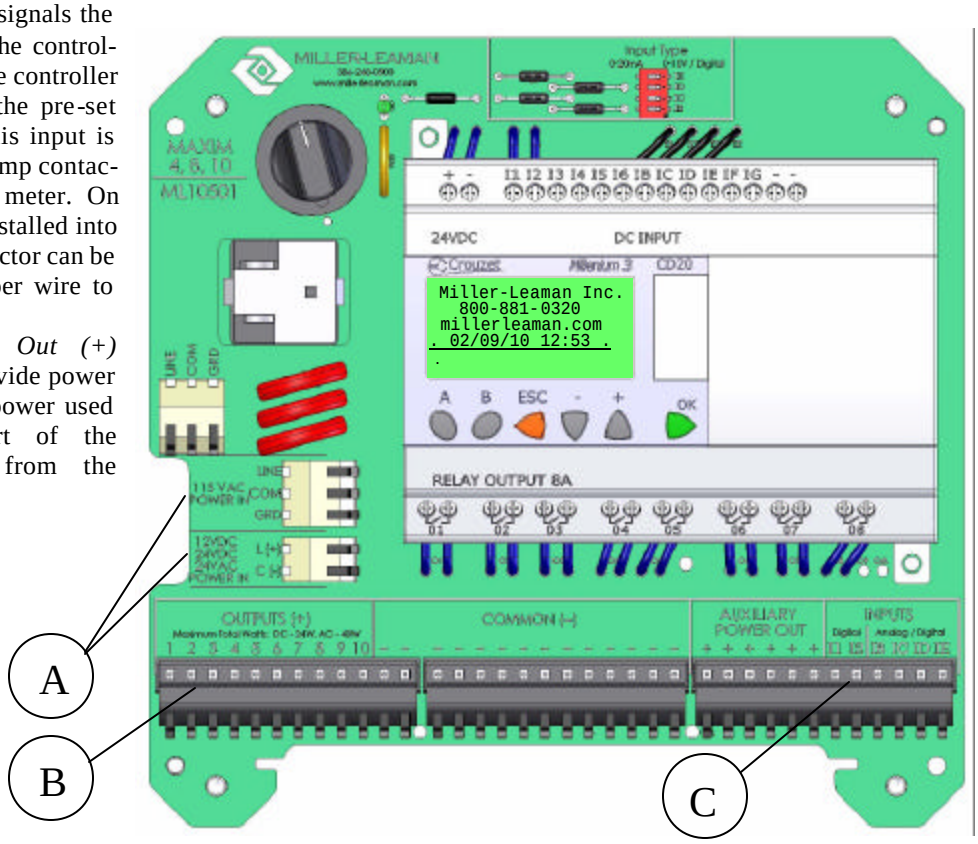
C. Inputs:

The inputs provide signals into the controller. Digital (on/off) inputs require a voltage input that matches the controller's operating voltage. Analog (0-10VDC, 0-20mA, 4-20mA) signals are available on 12VDC/24VDC powered controllers with the appropriate circuit board. Standard controller inputs are listed below. Additional inputs are available for customer specific programs designed by Miller-Leaman, Inc. These allow for additional features to be added (including signals from Pressure, Flow, and Level Sensors).

Standard Inputs:

- I1 (PD Gauge) - *I1* and *Auxiliary Power Out (+)* are connected to Normally Open contacts on the PD gauge. Once the PD set-point is reached, the contacts will close and signal the controller.
- I2 (Remote Start/Stop) - *I2* signals the backflush interval timer in the controller to run. This will allow the controller to backflush by time after the pre-set time period has passed. This input is commonly connected to a pump contactor, pressure switch, or flow meter. On some systems, a jumper is installed into *I2*. In this case, a relay/contactor can be installed in-line of the jumper wire to remotely start/stop the timer.

Note: The *Auxiliary Power Out (+)* connections may be used to provide power to sensors, etc. However, the power used must be considered as part of the maximum power available from the transformer.



Viewing the Menu Screens & Adjusting Values

Scrolling through Menu Screens

The *MAXIM* controller allows the operator to scroll through a selection of menu screens by pressing the **A** or **B** buttons. Press **A** to scroll backward to the previous menu or press **B** to scroll forward to the next menu. The LCD backlight will automatically turn on for 5 minutes when a button is pressed, thus allowing the operator to easily view the menus in low light situations.

The next few pages describe the menus in the order they are seen by scrolling with the **B** button from the home screen. The home screen displays company contact information and is the default screen when the controller is turned on.

Changing Values

To change an adjustable value, first scroll to the appropriate menu screen using the **A** or **B** button. Follow the directions below to modify the value.

1. The current selected value will show flashing blocks. Use the + or - keys to select another value if desired.
2. Press **OK** on the selected value. The value will change from flashing blocks to flashing numbers. (Flashing blocks indicate the value is locked into memory. Flashing numbers indicates the value is unlocked and can be changed.)
3. Press the + or - buttons to change the value. (Holding the + or - button will allow the value to increase at a faster rate after the first 10 increments have passed.)
4. When finished, press **OK** to save the change to memory. The value will return to flashing blocks.

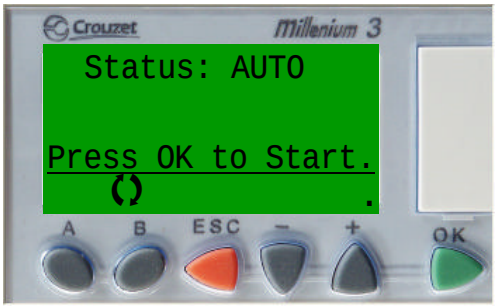
Monitoring the System Status & Initiating a Backflush

The Status Screen displays the current mode of the controller. It also allows the operator to manually start, stop or fast forward a backflush cycle. There are three ways that a backflush cycle can be initiated:

1. Manually, following the instructions below.
2. Automatically, by elapsed time (per the backflush frequency setting).
3. Automatically, by pressure differential (as set by the PD switch-gauge).

To initiate a manual backflush, press **OK** while on the status screen. To skip the current backflushing station, press + to "fast forward" to the next station. Note that holding the + button will hold the cycle in a dwell until it is released. At any time during the backflush cycle, press **ESC** to stop the cycle.

The current **Status** of the controller is displayed as follows:



1. **OFF** - Indicates that the backflush frequency timer is paused. The system will not backflush by the timer. There is assumed to be no flow going through the system. A backflush can still occur from a high pressure differential via the PD gauge or manually by the user. The controller displays **OFF** when there is no voltage input at *I2* on the controller.
2. **AUTO** - Indicates that the controller is awaiting for a backflush cycle to begin. The system is assumed to be in normal filtration mode and flowing water. The backflush frequency timer is running. The controller displays **AUTO** when there is a voltage input at *I2* on the controller.
3. **ON** - Indicates that the system is in backflush mode. The controller will also indicate which station is currently in a backflush or dwell.

When the pressure differential set-point is reached, the controller will display **High PSID** for a period of time (typically 5 seconds) before initiating a backflush cycle. The controller will automatically display the status screen if a backflush cycle is initiated or if the pressure differential set-point is reached.

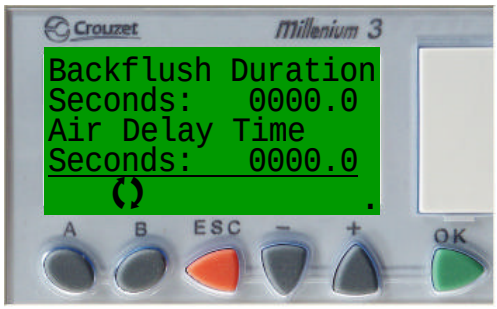
Adjustable Values

The following screens contain values that are operator adjustable. The controller's preset values may not be the recommended values. These values should be adjusted to meet the filter's backflush requirements. Reference the filter manufacturer's owner's manual for further information.

Backflush Interval: The operator-defined interval at which the system will initiate an automatic backflush cycle. The backflush frequency timer resets after any backflush cycle occurs (by timer, PD gauge, or operator). This value is adjustable from 1 minute to 1000 hrs. Setting both values to zero will turn off the backflush timer.

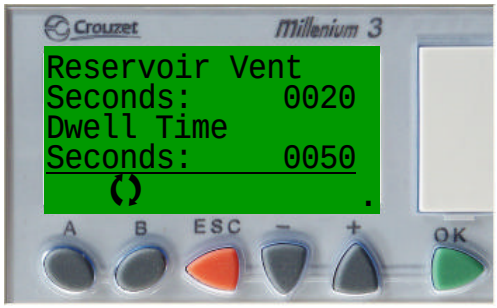
Backflush Duration: The time allotted for each individual filter station to backflush. On Air Assist systems, the backflush duration is limited to the amount of water in the reservoir and the amount of compressed air. This value is adjustable from 3 to 10 seconds.

Air Delay Time: The time period between the actuation of the backflush valves and the opening of the air injection valve. This time allows the 3-way valves to move into backflush mode before the compressed air is released to backflush the filter. This value is adjustable from 0.5 to 5 seconds (typically set to 1 second).

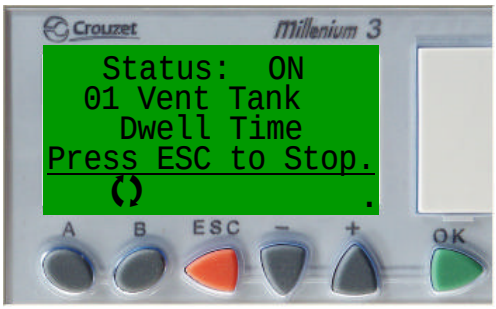


Reservoir Vent Time: The air-assist system utilizes stored filtered water for backflushing. The *Water Reservoir* must be refilled after a filter is backflushed. To refill the reservoir, air must be vented. Therefore, the *Reservoir Vent Time* is the time allowed for the water reservoir to refill after a backflush cycle. This value is adjustable from 5 to 120 seconds. This time is typically set between 15 and 40 seconds depending upon the reservoir size and water pressure.

Dwell Time: The amount of time allotted between the end of the backflush cycle for one filter station and the start of the backflush cycle for the next filter station in sequence. For Air Assist systems, the dwell must be set to allow sufficient time for an air compressor to fill the main air tank to completely. This value is adjustable from 0 to 300 seconds and is typically set between 15 to 60 seconds depending on the air supply.



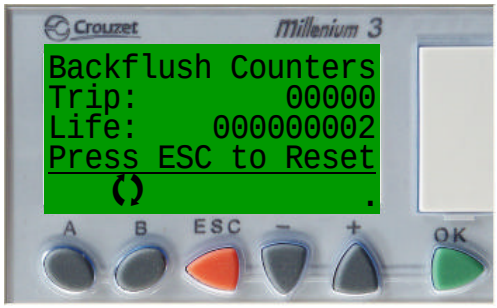
Water Reservoir: The *Water Reservoir* stores filtered water which is used for backflushing the filter. After a filter backflush, the reservoir is automatically refilled (as set per the *Reservoir Vent Time*). The water reservoir will always vent on system start up, main pump start and after every backflush
In addition the Dwell Time will always work in the same way. It is used to add the time for an air compressor to build up pressure in the main air tank.



Controller Feedback

The following screens provide system feedback. This allows the operator to monitor when and how the backflush cycle is occurring. It is typically recommended that the operator adjust the backflush frequency timer so that the system backflushes by time just before the pressure differential set-point is reached.

Backflush Counters
Trip: The number of backflush cycles that have occurred since the counter was last reset. This includes cycles initiated both manually and automatically. This counter can be reset by pressing the **ESC** button from the *Backflush Counters* screen.
Life: The number of backflush cycles that have occurred in the controller's lifetime. This includes cycles initiated both manually and automatically. This counter cannot be reset.



Time Since Last Backflush: The amount of time that has elapsed since the system last backflushed. The time displayed is in hours and minutes (example: 00011:30 is 11 hours and 30 minutes). This value does not include the elapsed time when the backflush frequency timer is off (either when the *Status Screen* reads *Status: Off* or when the controller is physically switched off).
This screen also displays how the last backflush was triggered. There are three possibilities:

1) *Operator* - the backflush was manually triggered by an operator via the status screen.
2) *Timer* - the backflush was triggered by time as set on the backflush frequency screen.
3) *PD gauge* - the backflush was triggered by a high pressure differential, as set on the PD gauge mounted below the controller enclosure.

Warranty Information

Limited Warranty

Upon purchase, users of Miller-Leaman's *MAXIM* product agree to the following terms, conditions, and limitations of warranty and liability coverage.

Miller-Leaman warrants this product to be free from original defects for one year from the date of original sale. The manufacturer will replace, free of charge, any part found defective under normal use and service within the guarantee period, provided the product is installed, used, and maintained in accordance with any applicable instructions or limitations issued by Miller-Leaman. Components supplied as replacement parts are warranted for (90) days from the date of shipment.

The manufacturer assumes no liability for incidental or consequential damage sustained in the adoption or use of our engineering data, service, or products. Liability is therefore limited to the repair of the products manufactured by Miller-Leaman, Inc. No agent or representative of Miller-Leaman has the authority to waive or add to this agreement. Altered products or use of products in a manner not intended shall void this warranty.

For warranty repair/replacement, please contact Miller-Leaman to obtain an RMA number. All defective items should be sent freight pre-paid to:

Miller-Leaman, Inc.
800 Orange Avenue
Daytona Beach, FL 32114
(386)248-0500 Phone / (386)248-3033 Fax
E:mail: sales@millerleaman.com
Web Address: www.millerleaman.com

Record your MAXIM controller serial number in the space below and retain it for warranty purposes or technical questions. The serial number is located on the left side of the controller enclosure.

Serial # MLI-M___-_____

State-of-the-art filter backflush controller

OWNER'S MANUAL

FOR THE TURBODISC PRODUCT LINE

Introduction

Thank you for purchasing the *MAXIM*, a state-of-the-art backwash controller designed for automatic filtration systems. The heart of the *MAXIM* is a programmable micro PLC, custom designed to maximize the performance of your filtration system. These components are protected by a robust, corrosion-proof watertight enclosure. The *MAXIM* has a user-friendly, menu driven controller that gives the user control of all critical automatic filter functions. The backlit LCD display provides real-time system status. The memory module (EEPROM) allows for installation of system upgrades and provides the ability to download custom, application specific programs without the need for a computer. Please read this manual prior to installation and retain it for future reference.

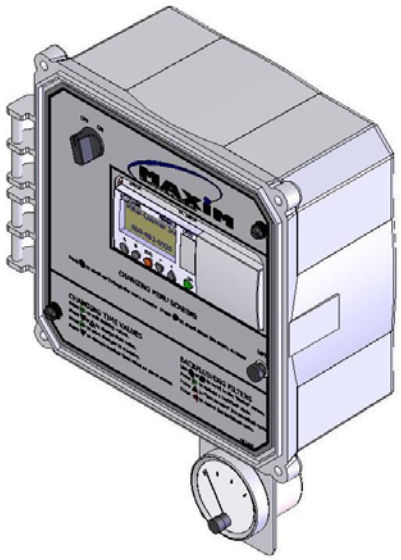
Contents

Installation

Some *MAXIM* controllers are pre-installed as a component of a complete filtration system while others come as a stand-alone unit. Follow the directions below only if it is necessary to connect the electrical or gauge connections.

Electrical Connections:

If the Maxim controller is not pre-wired as part of an automatic filter system, then it will be necessary to mount the controller on a flat surface using the mounting brackets provided. It will also be necessary to connect each filter station to a corresponding *Output (+)* and *Common (-)* terminal on the circuit board. Review the *Electrical Detail* section prior to making any connections to the controller. If requested custom input/output capabilities are not described in this manual, please refer to an attached addendum.



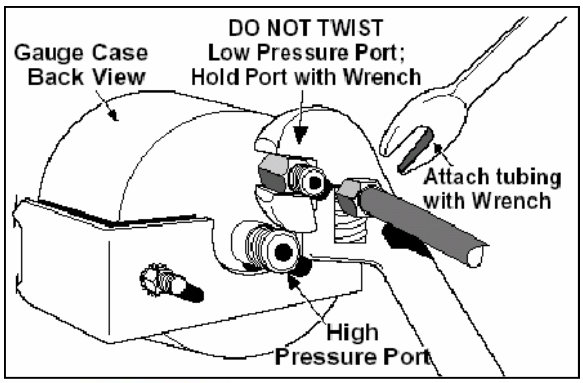
Differential Pressure Gauge Connections:

Connect the pressure differential (PD) gauge to the system's inlet (high) and outlet (low) pressure ports.

WARNING: Failure to use a second wrench on the low pressure port when tightening fittings may result in damage to the internal pressure tubing.

Be sure all connection tubing is clean prior to installation on the gauge. The gauge contains orifices that may become clogged by larger particles.

CAUTION: Make sure not to foul the pressure orifices with pipe dope or dirt, as the gauge will not operate.



Differential Pressure Gauge Set-point:

Adjust the contact to the desired PD set-point that will trigger a backflush cycle. The differential pressure switch-gauge contact should be set at the filter's recommended setting. Reference the filter manufacturer's owner's manual for the recommended PSID setting.

Electrical Detail

The circuit board layout shown applies to the M4, M8, and M10 controllers. The M_ in the serial number on the left side of the enclosure designates the controller's total number of outputs. For example, a MLI-M8-xxxxx has 8 available outputs (uses outputs 1-8 only, leaving outputs 9 and 10 unused). Review the connection details below before wiring to the controller.

CAUTION: Unplug controller from power source before removing cover!

A. Power supply connections:

- *115VAC Power In* provides power to the transformer. The standard controller comes equipped with a 115VAC wall outlet plug. 115VAC can be hard-wired into these connections if preferred.
- *12VDC/24VDC/24VAC Power In* provides power to the controller and circuit board connections. This power is typically provided from the transformer. If 115VAC power is not available for the transformer, low voltage power can be provided directly into these connections (make sure to remove and cap any existing transformer wires). The provided power must match the controller's operating voltage (indicated directly above the LCD screen).

Note: The standard transformer provides a maximum total power output as listed below. Exceeding the maximum available power may trip the fuse repeatedly or overload the transformer. The fuse is an automatic resetting type and will reset itself within a few seconds of being tripped.

Maximum power available: 12VDC or 24VDC - 24 Watts; 24VAC - 48 Watts

B. Outputs:

The outputs provide a voltage output (same as controller's voltage) to control the backflush valves, booster pump, solenoids, pressure sustaining valve, air override, etc. The last output is typically a *master output*, which remains on during the entire backflush cycle (typically controls sustaining valve / booster pump).

Note: Any *Common (-)* connection may be used for the common/negative terminals of the solenoids/valves.

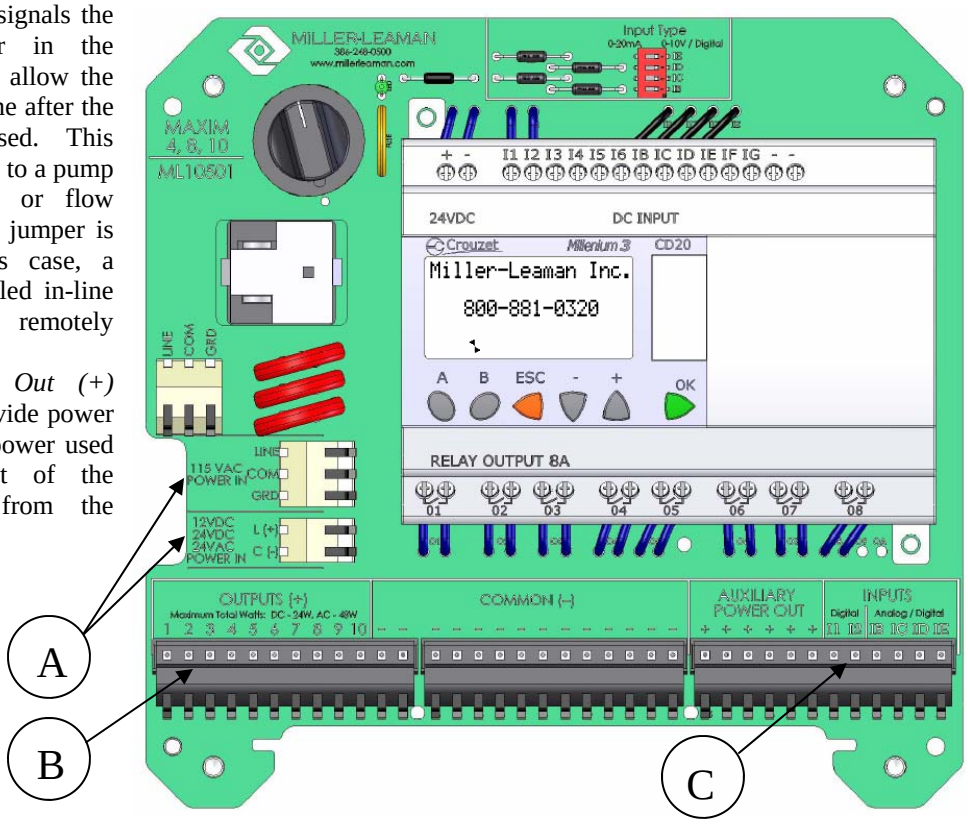
C. Inputs:

The inputs provide signals into the controller. Digital (on/off) inputs require a voltage input that matches the controller's operating voltage. Analog (0-10VDC, 0-20mA, 4-20mA) signals are available on 12VDC/24VDC powered controllers with the appropriate circuit board. Standard controller inputs are listed below. Additional inputs are available for customer specific programs designed by Miller-Leaman, Inc. These allow for additional features to be added (including signals from Pressure, Flow, and Level Sensors).

Standard Inputs:

- I1 (PD Gauge) - *I1* and *Auxiliary Power Out (+)* are connected to Normally Open contacts on the PD gauge. Once the PD set-point is reached, the contacts will close and signal the controller.
- I2 (Remote Start/Stop) - *I2* signals the backflush frequency timer in the controller to run. This will allow the controller to backflush by time after the pre-set time period has passed. This input is commonly connected to a pump contactor, pressure switch, or flow meter. On some systems, a jumper is installed into *I2*. In this case, a relay/contactor can be installed in-line of the jumper wire to remotely start/stop the timer.

Note: The *Auxiliary Power Out (+)* connections may be used to provide power to sensors, etc. However, the power used must be considered as part of the maximum power available from the transformer.



Viewing the Menu Screens & Adjusting Values

Scrolling through Menu Screens

The *MAXIM* controller allows the operator to scroll through a selection of menu screens by pressing the **A** or **B** buttons. Press **A** to scroll backward to the previous menu or press **B** to scroll forward to the next menu. The LCD back-light will automatically turn on for 5 minutes when a button is pressed, thus allowing the operator to easily view the menus in low light situations.

The next few pages describe the menus in the order they are seen by scrolling with the **B** button from the home screen. The home screen displays company contact information and is the default screen when the controller is turned on.

Changing Values

To change an adjustable value, first scroll to the appropriate menu screen using the **A** or **B** button. Follow the directions below to modify the value.

1. The current selected value will show flashing blocks. Use the + or - keys to select another value if desired.
2. Press **OK** on the selected value. The value will change from flashing blocks to flashing numbers. (Flashing blocks indicate the value is locked into memory. Flashing numbers indicates the value is unlocked and can be changed.)
3. Press the + or - buttons to change the value. (Holding the + or - button will allow the value to increase at a faster rate after the first 10 increments have passed.)
4. When finished, press **OK** to save the change to memory. The value will return to flashing blocks.

Monitoring the System Status & Initiating a Backflush

The Status Screen displays the current mode of the controller. It also allows the operator to manually start, stop or fast forward a backflush cycle. There are three ways that a backflush cycle can be initiated:

1. Manually, following the instructions below.
2. Automatically, by elapsed time (per the backflush frequency setting).
3. Automatically, by pressure differential (as set by the PD switch-gauge).

To initiate a manual backflush, press **OK** while on the status screen. To skip the current backflushing station, press + to "fast forward" to the next station. Note that holding the + button will hold the cycle in a dwell until it is released. At any time during the backflush cycle, press **ESC** to stop the cycle.

The current **Status** of the controller is displayed as follows:

1. **OFF** - Indicates that the backflush frequency timer is paused. The system will not backflush by the timer. There is assumed to be no flow going through the system. A backflush can still occur from a high pressure differential via the PD gauge or manually by the user. The controller displays **OFF** when there is no voltage input at *I2* on the controller.
2. **IDLE** - Indicates that the controller is awaiting for a backflush cycle to begin. The system is assumed to be in normal filtration mode and flowing water. The backflush frequency timer is running. The controller displays **IDLE** when there is a voltage input at *I2* on the controller.
3. **ON** - Indicates that the system is in backflush mode. The controller will also indicate which station is currently in a backflush or dwell.

When the pressure differential set-point is reached, the controller will display **High Press. Diff.!** for a period of time (typically 5 seconds) before initiating a backflush cycle. The controller will automatically display the status screen if a backflush cycle is initiated or if the pressure differential set-point is reached.

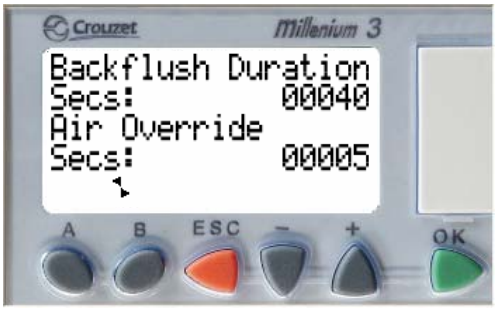
Adjustable Values

The following screens contain values that are operator adjustable. The controller's preset values may not be the recommended values. These values should be adjusted to meet the filter's backflush requirements. Reference the filter manufacturer's owner's manual for further information.

Backflush Frequency: The user-defined interval at which the system will initiate an automatic backflush cycle. The backflush frequency timer resets after any backflush cycle occurs (by timer, PD gauge, or operator). This value is adjustable from 1 minute to 1000 hrs. Setting both values to zero will turn off the backflush timer.

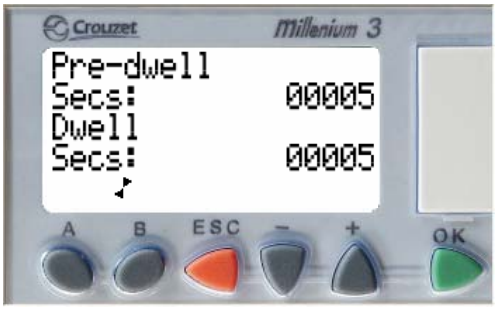
Backflush Duration: The time allotted for each individual filter station to backflush. This time should be set according to the type of filter and the nature of the material being filtered. This value is adjustable from 5 to 300 seconds.

Air Override Time: The amount of time that the *Air Override* solenoid turns on at the start of each filter station backflush. This value is adjustable from 5 to 300 seconds (typically set to 5 seconds).



Pre-dwell Time: The time allotted between the master output signal and the first filter station backflush. This period often allows time for the system to build pressure (via a master valve, booster pump, etc.) before backflushing begins. This value is adjustable from 0 to 300 seconds. A *pre-dwell time* is only necessary when using the *master output*.

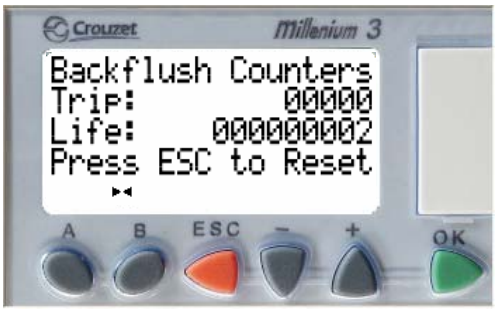
Dwell Time: The amount of time allotted between the end of the backflush cycle for one filter station and the start of the backflush cycle for the next filter station in sequence. This value is adjustable from 0 to 300 seconds.



Controller Feedback

The following screens provide system feedback. This allows the operator to monitor when and how the backflush cycle is occurring. It is typically recommended that the operator adjust the backflush frequency timer so that the system backflushes by time just before the pressure differential set-point is reached.

Backflush Counters
Trip: The number of backflush cycles that have occurred since the counter was last reset. This includes cycles initiated both manually and automatically. This counter can be reset by pressing the **ESC** button from the *Backflush Counters* screen.
Life: The number of backflush cycles that have occurred in the controller's lifetime. This includes cycles initiated both manually and automatically. This counter cannot be reset.



Time Since Last Backflush: The amount of time that has elapsed since the system last backflushed. The time displayed is in hours and minutes (example: 00011:30 is 11 hours and 30 minutes). This value does not include the elapsed time when the backflush frequency timer is off (either when the *Status Screen* reads *Status: Off* or when the controller is physically switched off).
This screen also displays how the last backflush was triggered. There are three possibilities:

1) *Operator* - the backflush was manually triggered by an operator via the status screen.
2) *Timer* - the backflush was triggered by time as set on the backflush frequency screen.
3) *PD gauge* - the backflush was triggered by a high pressure differential, as set on the PD gauge mounted below the controller enclosure.

Warranty Information

Limited Warranty

Upon purchase, users of Miller-Leaman's *MAXIM* product agree to the following terms, conditions, and limitations of warranty and liability coverage.

Miller-Leaman warrants this product to be free from original defects for one year from the date of original sale. The manufacturer will replace, free of charge, any part found defective under normal use and service within the guarantee period, provided the product is installed, used, and maintained in accordance with any applicable instructions or limitations issued by Miller-Leaman. Components supplied as replacement parts are warranted for (90) days from the date of shipment.

The manufacturer assumes no liability for incidental or consequential damage sustained in the adoption or use of our engineering data, service, or products. Liability is therefore limited to the repair of the products manufactured by Miller-Leaman, Inc. No agent or representative of Miller-Leaman has the authority to waive or add to this agreement. Altered products or use of products in a manner not intended shall void this warranty.

For warranty repair/replacement, please contact Miller-Leaman to obtain an RMA number. All defective items should be sent freight pre-paid to:

Miller-Leaman, Inc.
800 Orange Avenue
Daytona Beach, FL 32114
(386)248-0500 Phone / (386)248-3033 Fax
E:mail: sales@millerleaman.com
Web Address: www.millerleaman.com

Record your MAXIM controller serial number in the space below and retain it for warranty purposes or technical questions. The serial number is located on the left side of the controller enclosure.

Serial # MLI-M___-_____

State-of-the-art filter backflush controller

OWNER'S MANUAL

FOR THE TOWERGUARD PRODUCT LINE

Introduction

Thank you for purchasing the *MAXIM,* a state-of-the-art backflush controller designed for automatic filtration systems. The heart of the *MAXIM* is a programmable micro PLC, custom designed to maximize the performance of your filtration system. These components are protected by a robust, corrosion-proof watertight enclosure. The *MAXIM* has a user-friendly, menu driven controller that gives the user control of all critical automatic filter functions. The backlit LCD display provides real-time system status. The memory module (EEPROM) allows for installation of system upgrades and provides the ability to download custom, application specific programs without the need for a computer. Please read this manual prior to installation and retain it for future reference.

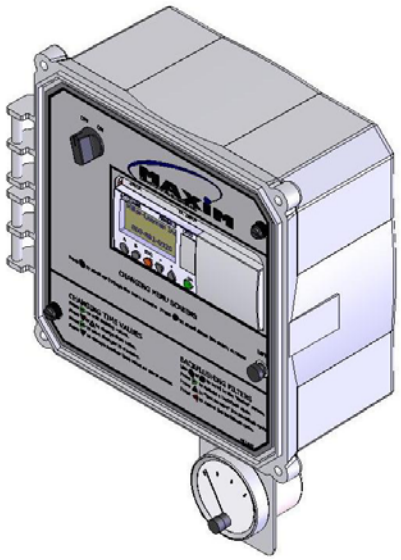
Contents

Installation

Some *MAXIM* controllers are pre-installed as a component of a complete filtration system while others come as a stand-alone unit. Follow the directions below only if it is necessary to connect the electrical or gauge connections.

Electrical Connections:

If the Maxim controller is not pre-wired as part of an automatic filter system, then it will be necessary to mount the controller on a flat surface using the mounting brackets provided. It will also be necessary to connect each filter station to a corresponding *Output (+)* and *Common (-)* terminal on the circuit board. Review the *Electrical Detail* section prior to making any connections to the controller. If requested custom input/output capabilities are not described in this manual, please refer to an attached addendum.



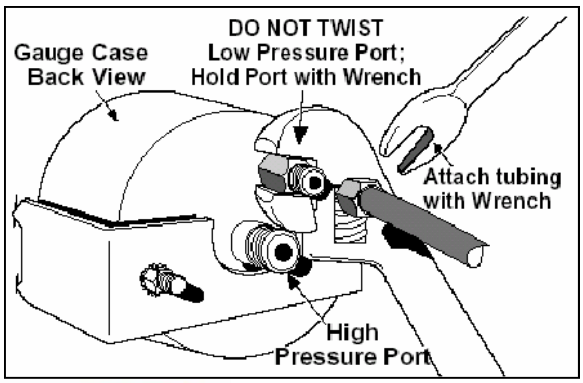
Differential Pressure Gauge Connections:

Connect the pressure differential (PD) gauge to the system's inlet (high) and outlet (low) pressure ports.

WARNING: Failure to use a second wrench on the low pressure port when tightening fittings may result in damage to the internal pressure tubing.

Be sure all connection tubing is clean prior to installation on the gauge. The gauge contains orifices that may become clogged by larger particles.

CAUTION: Make sure not to foul the pressure orifices with pipe dope or dirt, as the gauge will not operate.



Differential Pressure Gauge Set-point:

Adjust the contact to the desired PD set-point that will trigger a backflush cycle. The differential pressure switch-gauge contact should be set at the filter's recommended setting. Reference the filter manufacturer's owner's manual for the recommended PSID setting.

Electrical Detail

The circuit board layout shown applies to the M4, M8, and M10 controllers. The M_ in the serial number on the left side of the enclosure designates the controller's total number of outputs. For example, a MLI-M8-xxxxx has 8 available outputs (uses outputs 1-8 only, leaving outputs 9 and 10 unused). Review the connection details below before wiring to the controller.

CAUTION: Unplug controller from power source before removing cover!

A. Power supply connections:

- *115VAC Power In* provides power to the transformer.
- *12VDC/24VDC/24VAC Power In* provides power to the controller and circuit board connections. This power is typically provided from the transformer.

Note: The standard transformer provides a maximum total power output as listed below. Exceeding the maximum available power may trip the fuse repeatedly or overload the transformer. The fuse is an automatic resetting type and will reset itself within a few seconds of being tripped.

Maximum power available: 12VDC or 24VDC - 24 Watts; 24VAC - 48 Watts

B. Outputs:

The outputs provide a voltage output (same as controller's voltage) to control the backflush valves, pump starter, etc.

Note: Any *Common (-)* connection may be used for the common/negative terminals of the solenoids/valves.

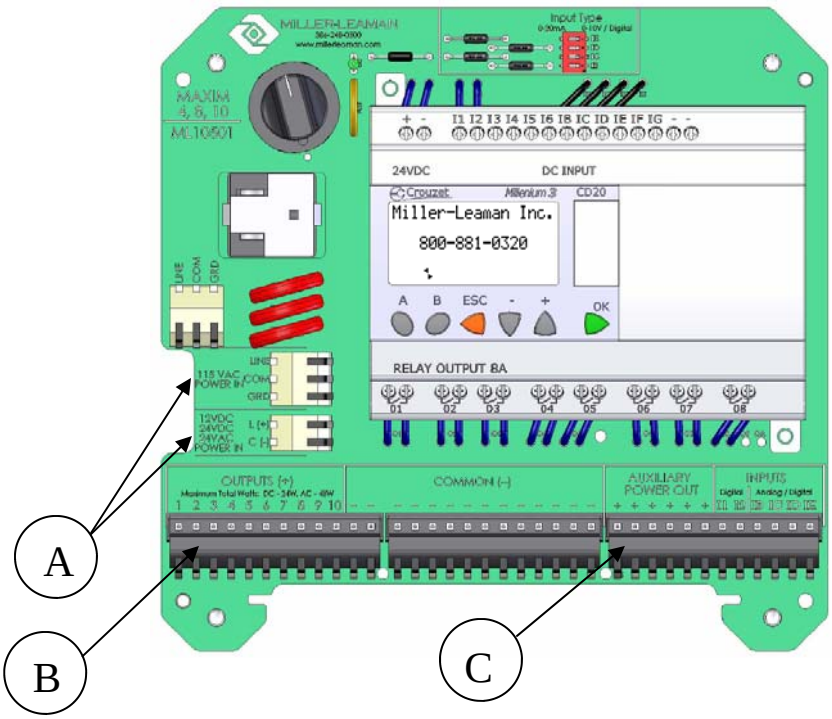
- Output 1: Backflush valves actuate for backflush flow. This output is activated at the beginning of a backflush cycle to reverse water flow through the filter.
- Output 2: Backflush valves actuate for normal flow. This output is activated after backflushing is complete to return water to normal flow.
- Ouput 4: Pump Starter. This turns the pump off while the valves are changing positions during a backflush cycle. The pump must be operated in "Auto" mode for this to occur.

C. Inputs:

The inputs provide signals into the controller. Digital (on/off) inputs require a voltage input that matches the controller's operating voltage. The controller inputs are listed below.

Standard Inputs:

- I1 (PD Gauge) - *I1* and *Auxiliary Power Out (+)* are connected to Normally Open contacts on the PD gauge. Once the PD set-point is reached, the contacts will close and signal the controller.



Viewing the Menu Screens & Adjusting Values

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The *MAXIM* controller allows the operator to scroll through a selection of menu screens by pressing the **A** or **B** buttons. Press **A** to scroll backward to the previous menu or press **B** to scroll forward to the next menu. The LCD back-light will automatically turn on for 5 minutes when a button is pressed, thus allowing the operator to easily view the menus in low light situations.

The next few pages describe the menus in the order they are seen by scrolling with the **B** button from the status screen.

Changing Values

To change an adjustable value, first scroll to the appropriate menu screen using the **A** or **B** button. Follow the directions below to modify the value.

1. The current selected value will show flashing blocks. Use the + or - keys to select another value if desired.
2. Press **OK** on the selected value. The value will change from flashing blocks to flashing numbers. (Flashing blocks indicate the value is locked into memory. Flashing numbers indicates the value is unlocked and can be changed.)
3. Press the + or - buttons to change the value. (Holding the + or - button will allow the value to increase at a faster rate after the first 10 increments have passed.)
4. When finished, press **OK** to save the change to memory. The value will return to flashing blocks.

Monitoring the System Status & Initiating a Backflush

The Status Screen displays the current mode of the controller. It also allows the operator to manually start or stop a backflush cycle. There are three ways that a backflush cycle can be initiated:

1. Manually, following the instructions below.
2. Automatically, by elapsed time (per the backflush frequency setting).
3. Automatically, by pressure differential (as set by the PD switch-gauge).

To initiate a manual backflush, press **OK** while on the status screen. At any time during the backflush cycle, press **ESC** to stop the cycle.

The current **Status** of the controller is displayed as follows:

1. **IDLE** - Indicates that the controller is awaiting for a backflush cycle to begin. The system is assumed to be in normal filtration mode and flowing water. The backflush frequency timer is running.
2. **ON -** Indicates that the system is in backflush mode.

Valves to Backflush is displayed at the beginning of a backflush cycle as the valves are redirecting water from normal flow to backflush flow. The controller will automatically turn the pump off while it is changing the valve positions. **Backflushing System** is displayed when the pump is cycling water through the system in backflush mode. **Valves to Filtration** is displayed at the end of a backflush cycle as the valves are returning to normal flow positions.

When the pressure differential set-point is reached, the controller will display **High Press. Diff.!** for a period of time (typically 5 seconds) before initiating a backflush cycle. The controller will automatically display the status screen if a backflush cycle is initiated or if the pressure differential set-point is reached.

Adjustable Values

Backflush Frequency: The user-defined interval at which the system will initiate an automatic backflush cycle. The backflush frequency timer resets after any backflush cycle occurs (by timer, PD gauge, or operator). This value is adjustable from 1 to 1000 hrs.

Backflush Duration: The time allotted for each individual filter station to backflush. This time should be set according to the type of filter and the nature of the material being filtered. This value is adjustable from 1 to 1000 seconds.

Tower/City Water Backflush: The type of water used for backflushing the system.

Press and hold OK to change between Tower (source) and City (alternate) water backflush. This must be accompanied by placing the 3-way valve in the corresponding position. See your TowerGuard Owner's Manual for more details.

Note: The controller's default setting is for Tower Water Backflush.

Controller Feedback

The following screens provide system feedback. This allows the operator to monitor when and how the backflush cycle is occurring. It is typically recommended that the operator adjust the backflush frequency timer so that the system backflushes by time just before the pressure differential set-point is reached.

Backflush Counter:
The number of backflush cycles that have occurred since the counter was last reset. This includes cycles initiated both manually and automatically. This counter can be reset by pressing the **ESC** button from the *Backflush Counter* screen.

Time Since Last Backflush: The amount of time that has elapsed since the system last backflushed. The time displayed is in hours. This value does not include the elapsed time when the backflush frequency timer is off (either when the *Status Screen* reads *Status: Off* or when the controller is physically switched off).
This screen also displays how the last backflush was triggered. There are three possibilities:

1) *Operator* - the backflush was manually triggered by an operator via the status screen.
2) *Timer* - the backflush was triggered by time as set on the backflush frequency screen.
3) *PD gauge* - the backflush was triggered by a high pressure differential, as set on the PD gauge mounted below the controller enclosure.

Warranty Information

Limited Warranty

Upon purchase, users of Miller-Leaman's *MAXIM* product agree to the following terms, conditions, and limitations of warranty and liability coverage.

Miller-Leaman warrants this product to be free from original defects for one year from the date of original sale. The manufacturer will replace, free of charge, any part found defective under normal use and service within the guarantee period, provided the product is installed, used, and maintained in accordance with any applicable instructions or limitations issued by Miller-Leaman. Components supplied as replacement parts are warranted for (90) days from the date of shipment.

The manufacturer assumes no liability for incidental or consequential damage sustained in the adoption or use of our engineering data, service, or products. Liability is therefore limited to the repair of the products manufactured by Miller-Leaman, Inc. No agent or representative of Miller-Leaman has the authority to waive or add to this agreement. Altered products or use of products in a manner not intended shall void this warranty.

For warranty repair/replacement, please contact Miller-Leaman to obtain an RMA number. All defective items should be sent freight pre-paid to:

Miller-Leaman, Inc.
800 Orange Avenue
Daytona Beach, FL 32114
(386)248-0500 Phone / (386)248-3033 Fax
E:mail: sales@millerleaman.com
Web Address: www.millerleaman.com

Record your MAXIM controller serial number in the space below and retain it for warranty purposes or technical questions. The serial number is located on the left side of the controller enclosure.

Serial # MLI-M___-_____

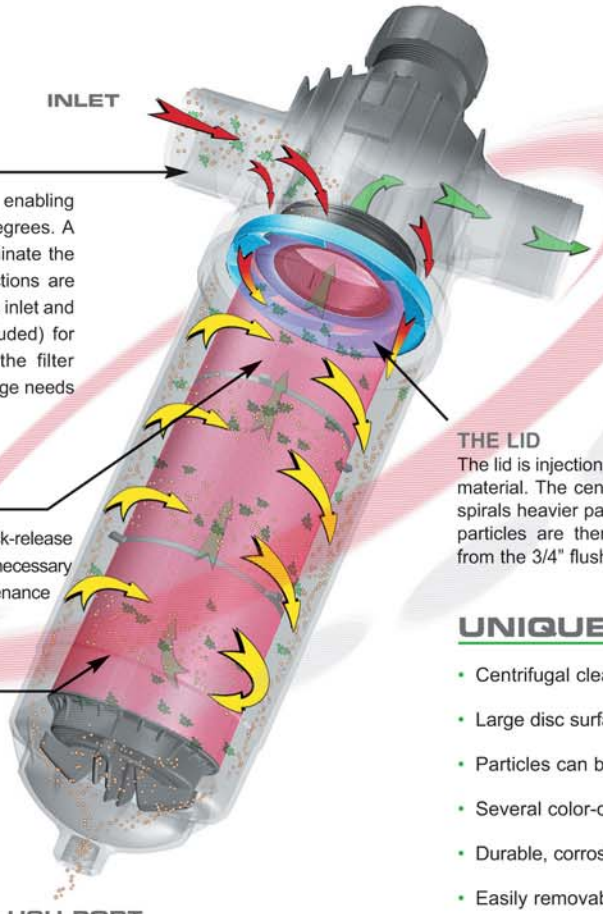
Helix HD & HS Series
Information & Owner's Manual

HELIX



HD SERIES

Miller Leaman's Helix Disc filter models are available in three different sizes: 2", 2" Super and 3". The filters can be installed in any orientation; however, it is preferable to install them in the inverted position (3/4" flush port at bottom). This helps the filtration system work at it's optimum. As water enters the filter housing, a high velocity centrifugal action occurs, spiraling heavier particles (sediment, scale, etc.) away from the disc cartridge, down to the base of the filter. These accumulated particles are then flushed from the filter via the 3/4" flush port connection at the base of the filter (valve not included).



THE BODY
The body contains one inlet and two outlets, enabling the filter to be installed at either 90 or 180-degrees. A threaded cap is supplied with the filter to terminate the outlet port not being used. Inlet/outlet connections are available in NPT or Victaulic. The body contains inlet and outlet pressure gauge ports (gauges not included) for monitoring the pressure differential across the filter element which determines when the disc cartridge needs to be removed for maintenance.

THE CLOSURE
Manufactured in Type 316 stainless steel, the quick-release clamp assembly is strong and reliable. No tools are necessary to remove the clamp and filter cover when maintenance is required.

THE DISC
The three-dimensional disc is ideal for filtering hard particles (such as sediment and scale) and soft fibrous material (such as algae, bugs, cottonwood seed, etc.). The color-coded discs are available in a variety of micron sizes.

THE LID
The lid is injection-molded, using an incredibly strong polyamide material. The centrifugal action, created by the Helix-Element, spirals heavier particles down to the base of the filter. The particles are then flushed, either manually or automatically, from the 3/4" flush port at the lowest point in the lid.

UNIQUE FEATURES

- Centrifugal cleaning action minimizes maintenance
- Large disc surface area, with three-dimensional depth
- Particles can be flushed while filter is in operation
- Several color-coded disc options available
- Durable, corrosion-resistant, injection-molded housing
- Easily removable, quick clamp lid assembly
- Pressure gauge ports molded into housing

HOW IT WORKS

1. Dirty water enters the filter housing through the inlet connection.
2. As dirty water passes through the Helix-Element, the water starts to spin at high velocity. This centrifugal action spins the particles away from the disc media, minimizing manual cleaning frequency.
3. As particles are spun down to the base of the filter, they are flushed via the 3/4" female threaded flush port connection.
4. The dirty water passes from the outside to the inside of the discs. The grooves, molded into the surface of th e three-dimensional discs, trap the remaining contaminants in the water.
5. After passing through the discs, the filtered water flows upward and exits the filter through one of the outlets. The outlet not being used is terminated with a threaded cap.

MILLER-LEAMAN
INCORPORATED

800 Orange Avenue • Daytona Beach, Florida 32114 • www.millerleaman.com
TEL 386.248.0500 • FAX 386.248.3033 • TOLL FREE 800.881.0320
EMAIL sales@millerleaman.com




HD SERIES

TECHNICAL DATA

Flow Rates for a Single Filter Housing

2"/100 GPM Max.*
2" Super/100 GPM Max.*
3"/200 GPM Max.*
Multiple pods are manifolded for higher flow rates

* Maximum flow rates should be derated for high solids loading, particularly for finer disc media.

Pressure Rating

All units rated to 125 PSI

Temperature Rating

All units rated to 140° F

Inlet/Outlet Configurations

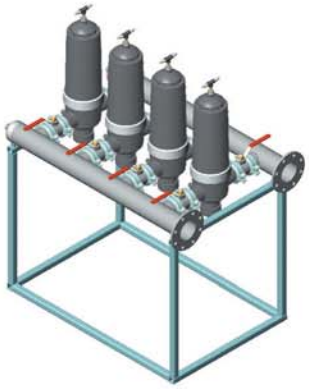
2" and 3" models available with NPT and/or Victaulic inlet/outlet connections
In-line and 90-degree configurations standard
(Filter is supplied with a cap for outlet port not being used)

Construction Materials

Housing: Polyamide
Discs: Polypropylene
Gaskets: EPDM
Filter Pod Clamp: Stainless Steel (Type 316)

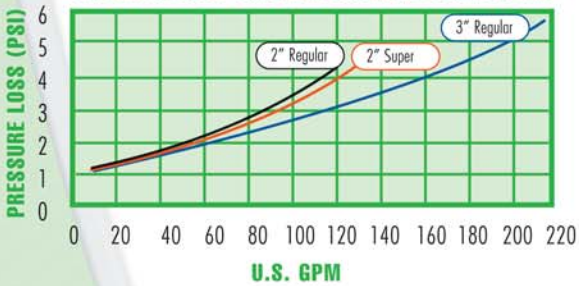
Micron Options Available

- 200 Micron (80 Mesh)
- 100 Micron (150 Mesh)
- 130 Micron (120 Mesh)
- 50 Micron (250 Mesh)



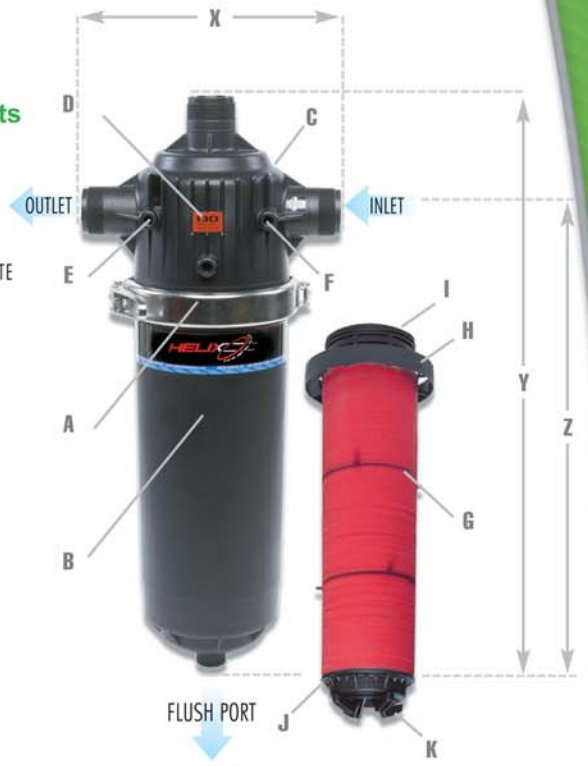
Please contact your distributor about modular capabilities.

PRESSURE LOSS THROUGH SINGLE FILTER HOUSING



Filter Components

A. BAND-CLAMP ASSEMBLY
B. REMOVABLE FILTER LID
C. FILTER BODY
D. MICRON/MESH DATA PLATE
E. OUTLET GAUGE PORT (GAUGE NOT INCLUDED)
F. INLET GAUGE PORT (GAUGE NOT INCLUDED)
G. FILTER DISC CARTRIDGE
H. HELIX-ELEMENT
I. O-RING SEAL
J. CARTRIDGE COVER PLATE
K. THREADED WING BOLT
X. SEE TABLE BELOW
Y. SEE TABLE BELOW
Z. SEE TABLE BELOW



MODEL NUMBER	MODEL TYPE	INLET/OUTLET SIZE & TYPE	FILTER SURFACE AREA (SQ. IN.)	FLUSH PORT CONNECTION SIZE	MAXIMUM FLOW (GPM)	MAXIMUM PRESSURE RATING (PSI)	X (SEE DIAGRAM ABOVE)	Y (SEE DIAGRAM ABOVE)	Z (SEE DIAGRAM ABOVE)
HD -2NA-*	Regular	2"/NPT	186	3/4"	100	125 PSI	12 1/8"	24 1/8"	18"
HD -2SA-*	Super	2"/NPT	263	3/4"	100	125 PSI	12 1/8"	28 3/4"	22 15/16"
HD -3NA-*	Regular	3"/NPT	263	3/4"	200	125 PSI	13 1/4"	30"	22 15/16"
HD -2NW-*	Regular	2"/Victaulic	186	3/4"	100	125 PSI	12 1/8"	24 1/8"	18"
HD -2SW-*	Super	2"/Victaulic	263	3/4"	100	125 PSI	12 1/8"	28 3/4"	22 15/16"
HD -3NW-*	Regular	3"/Victaulic	263	3/4"	200	125 PSI	13 1/4"	30"	22 15/16"

* 50, 100, 130,& 200 micron options available. Please specify disc size when ordering. Example: HD-2SA-130 = 2" NPT Super with 130 - micron discs.

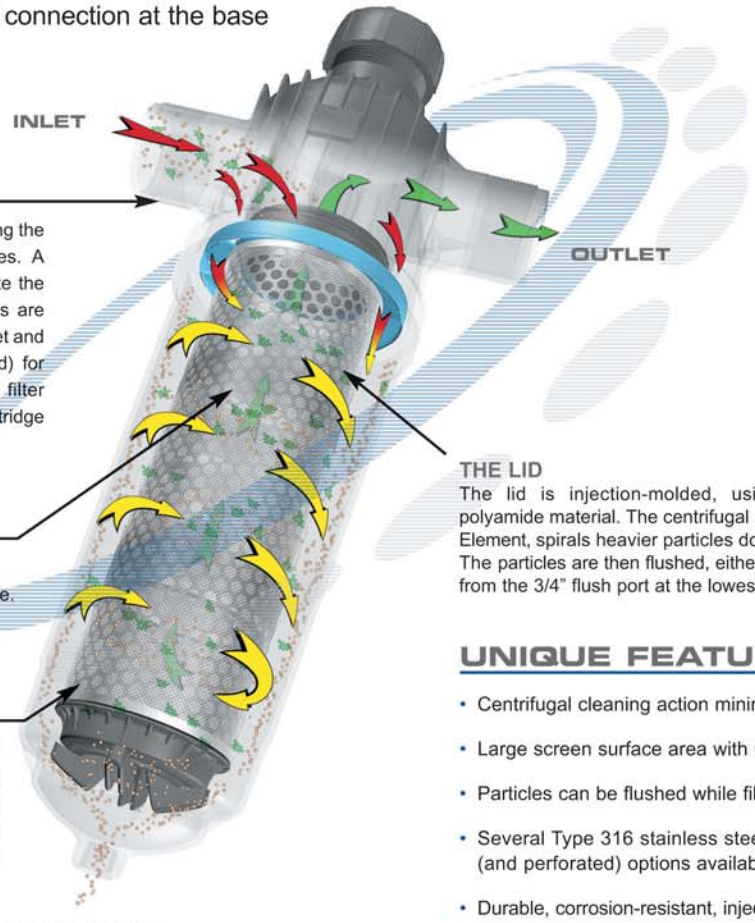
** Disc cartridges for 2" regular models (HD-2NA and HD-2NW) and 2" super models (HD-2SA and HD-2SW) vary in size. The cartridge for the 2" regular models is 15.5" in height; The cartridge for the 2" super models is 20.5" in height. This means that the 2" super models have approximately 40% more surface area for filtration (186 sq. inches vs. 263 sq. inches).

HELIX



HS SERIES

Miller Leaman's Helix Screen filter models are available in three different sizes: 2", 2" Super and 3". The filters can be installed in any orientation; however, it is preferable to install them in the inverted position (3/4" flush port at bottom). This helps the filtration system work at it's optimum. As water enters the filter housing, a high velocity centrifugal action occurs, spiraling heavier particles (sediment, scale, etc.) away from the screen cartridge, down to the base of the filter. These accumulated particles are then flushed from the filter via the 3/4" flush port connection at the base of the filter (valve not included).



THE BODY
The body contains one inlet and two outlets, allowing the filter to be installed at either 90 or 180-degrees. A threaded cap is supplied with the filter to terminate the outlet port not being used. Inlet/outlet connections are available in NPT or Victaulic. The body contains inlet and outlet pressure gauge ports (gauges not included) for monitoring the pressure differential across the filter screen which determines when the screen cartridge needs to be removed for maintenance.

THE CLOSURE
Manufactured in Type 316 stainless steel, the quick-release clamp assembly is strong and reliable. No tools are necessary to remove the clamp and filter cover when maintenance is required.

THE SCREEN
Available with a variety of stainless steel screen sizes from coarse perforated material to a fine mesh. The two-dimensional screen filter is ideally suited for removal of hard, non-organic particles such as sand. Standard screen material is Type 316.

THE LID
The lid is injection-molded, using an incredibly strong polyamide material. The centrifugal action, created by the Helix Element, spirals heavier particles down to the base of the filter. The particles are then flushed, either manually or automatically, from the 3/4" flush port at the lowest point in the lid.

UNIQUE FEATURES

- Centrifugal cleaning action minimizes maintenance
- Large screen surface area with maximum open area
- Particles can be flushed while filter is in operation
- Several Type 316 stainless steel mesh (and perforated) options available
- Durable, corrosion-resistant, injection molded housing
- Easily removable, quick clamp lid assembly
- Pressure gauge ports molded into housing

HOW IT WORKS

1. Dirty water enters the filter housing through the inlet connection.
2. As dirty water passes through the Helix-Element, the water starts to spin at high velocity. This centrifugal action spins the particles away from the screen, minimizing manual cleaning frequency.
3. As particles are spun down to the base of the filter, they are flushed via the 3/4" female threaded flush port connection.
4. The dirty water passes from the outside to the inside of the stainless steel screen. The screen captures the remaining light and fibrous contaminants from the water.
5. After passing through the screen, the filtered water flows upward and exits the filter through one of the outlets. The outlet not being used is terminated with a threaded cap.

MILLER-LEAMAN INCORPORATED

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EMAIL sales@millerleaman.com

HS SERIES

TECHNICAL DATA

Flow Rates for a Single Filter Housing

2"/100 GPM Max.*
2" Super/100 GPM Max.*
3"/200 GPM Max.*
Multiple pods are manifolded for higher flow rates

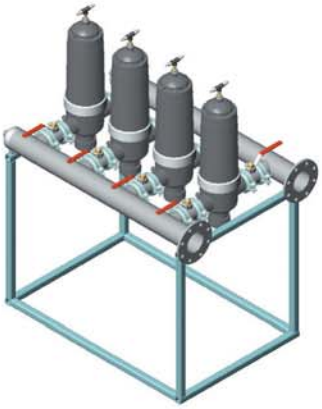
* Maximum flow rates should be derated for high solids loading, particularly for finer mesh sizes.

Pressure Rating

All units rated to 125 PSI

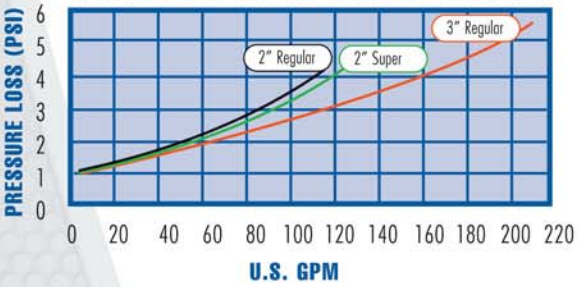
Temperature Rating

All units rated to 140° F



Please contact your distributor about modular capabilities.

PRESSURE LOSS THROUGH SINGLE FILTER HOUSING



Inlet/Outlet Configurations

2" and 3" models available with NPT and/or Victaulic inlet/outlet connections
In-line and 90 degree configurations standard
(Filter is supplied with a cap for outlet port not being used)

Construction Materials

Housing: Polyamide
Screen: Stainless Steel (Type 316)
Gaskets: EPDM
Filter Pod Clamp: Stainless Steel (Type 316)

Screen Sizes Available

16, 30, 40, 50, 60, 80, 100, 120, 150, 200
1/4" perforated, 1/8" perforated, 5/64" perforated, 1/16" perforated (Other sizes available by special order)

Filter Components

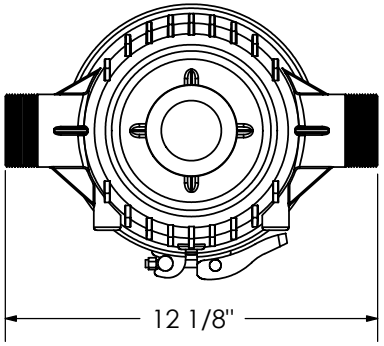
A. BAND-CLAMP ASSEMBLY
B. REMOVABLE FILTER LID
C. FILTER BODY
D. MESH/MICRON DATA PLATE
E. OUTLET GAUGE PORT (GAUGE NOT INCLUDED))
F. INLET GAUGE PORT (GAUGE NOT INCLUDED)
G. FILTER SCREEN CARTRIDGE
H. HELIX-ELEMENT
I. O-RING SEAL
J. CARTRIDGE COVER PLATE
K. THREADED WING BOLT
X. SEE TABLE BELOW
Y. SEE TABLE BELOW
Z. SEE TABLE BELOW

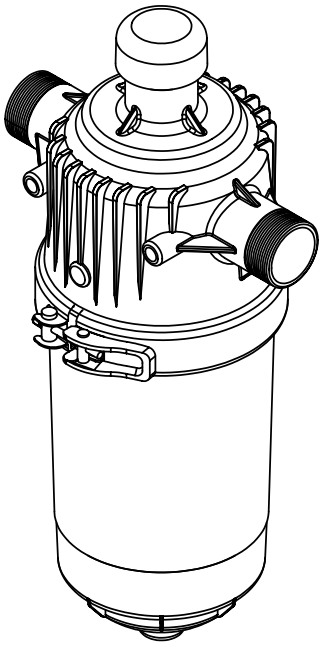
MODEL NUMBER	MODEL TYPE	INLET/OUTLET SIZE & TYPE	FILTER SURFACE AREA (SQ. IN.)	FLUSH PORT CONNECTION SIZE	MAXIMUM FLOW (GPM)	MAXIMUM PRESSURE RATING (PSI)	X (SEE DIAGRAM ABOVE)	Y (SEE DIAGRAM ABOVE)	Z (SEE DIAGRAM ABOVE)
HS -2NA-*	Regular	2"/NPT	186	3/4"	100	125 PSI	12 1/8"	24 1/8"	18"
HS -2SA-*	Super	2"/NPT	263	3/4"	100	125 PSI	12 1/8"	28 3/4"	22 15/16"
HS -3NA-*	Regular	3"/NPT	263	3/4"	200	125 PSI	13 1/4"	30"	22 15/16"
HS -2NW-*	Regular	2"/Victaulic	186	3/4"	100	125 PSI	12 1/8"	24 1/8"	18"
HS -2SW-*	Super	2"/Victaulic	263	3/4"	100	125 PSI	12 1/8"	28 3/4"	22 15/16"
HS -3NW-*	Regular	3"/Victaulic	263	3/4"	200	125 PSI	13 1/4"	30"	22 15/16"

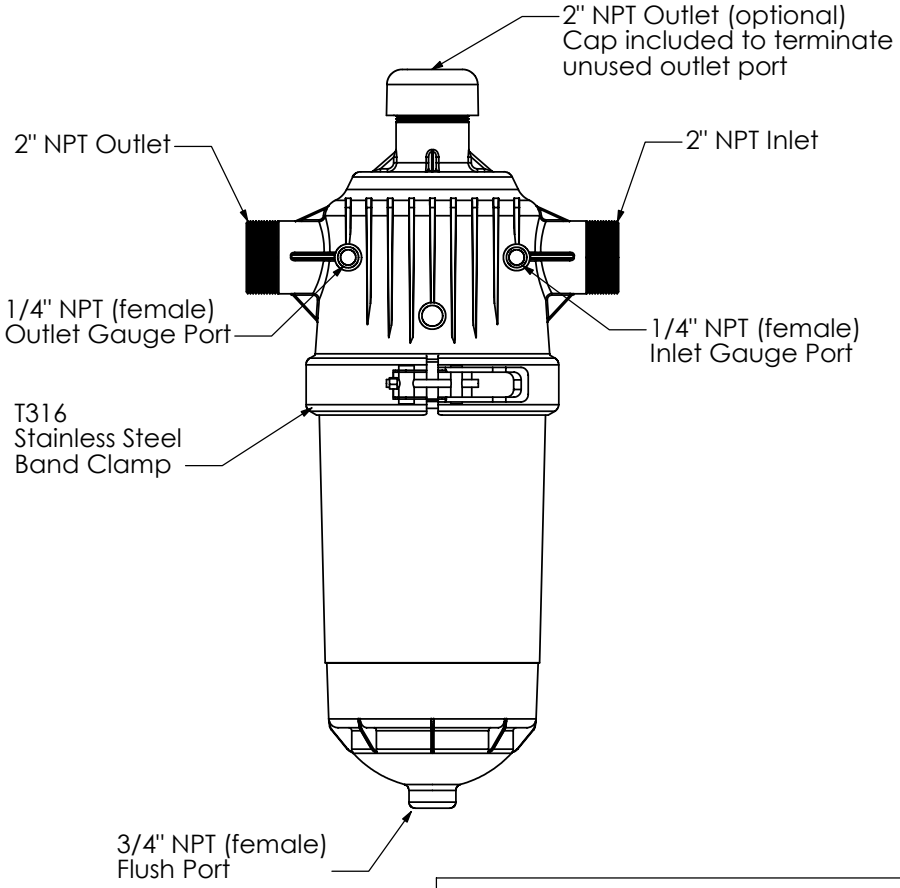
* Please specify screen size when ordering. Example: HS-2NA - 100 = 2" NPT filter with 100 - mesh screen.

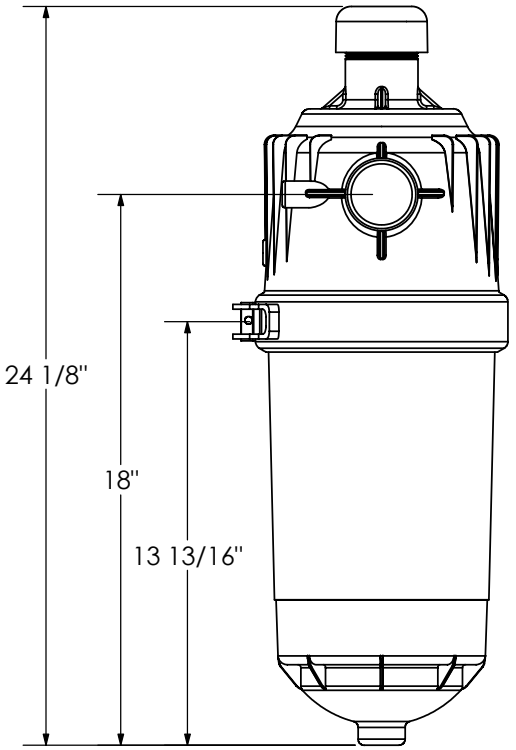
** Screen cartridges for 2" regular models (HS-2NA and HS-2NW) and 2" super models (HS-2SA and HS-2SW) vary in size. The cartridge for the 2" regular models is 15.5" in height; The cartridge for the 2" super models is 20.5" in height. This means that the 2" super models have approximately 40% more surface area for filtration (186 sq. inches vs. 263 sq. inches).

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED



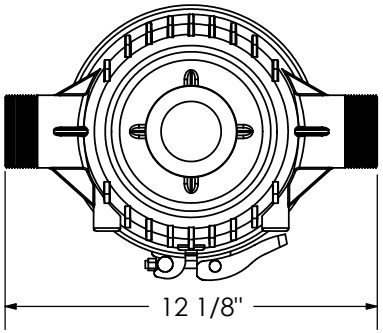


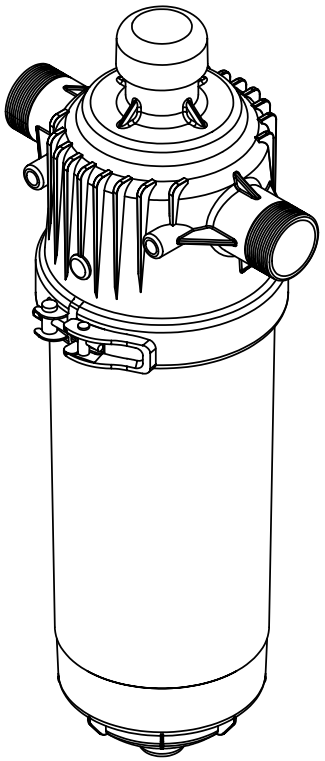


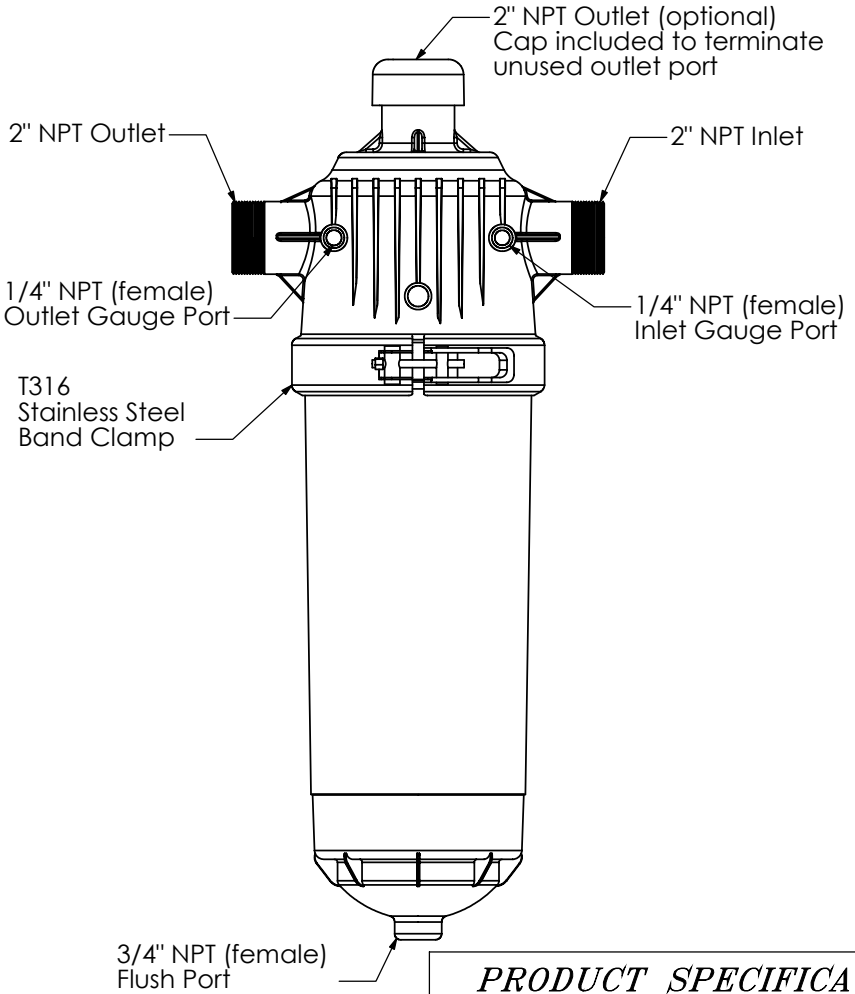


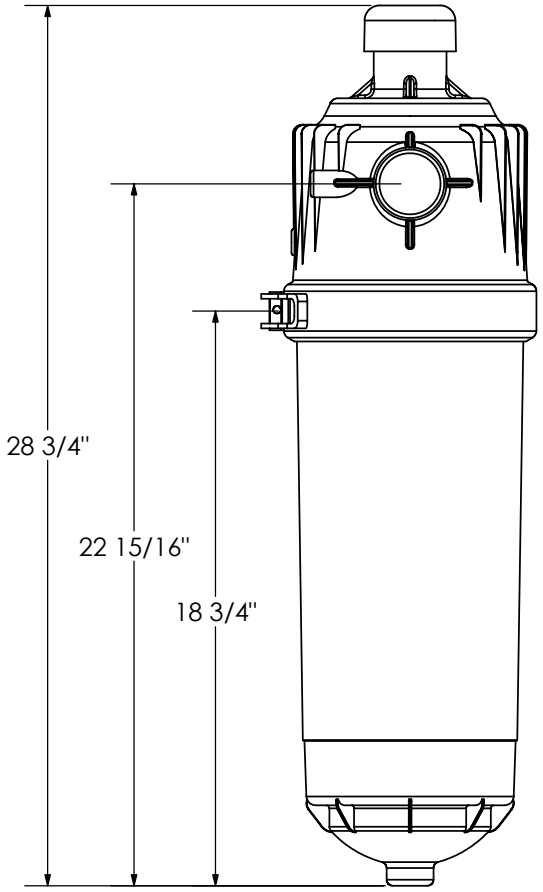
PRODUCT SPECIFICATION	DRAWN	S. Richards	9/26/03	TITLE
	CHECKED			2NA Helix Filter Housing
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED



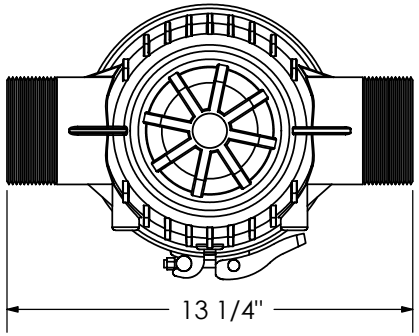


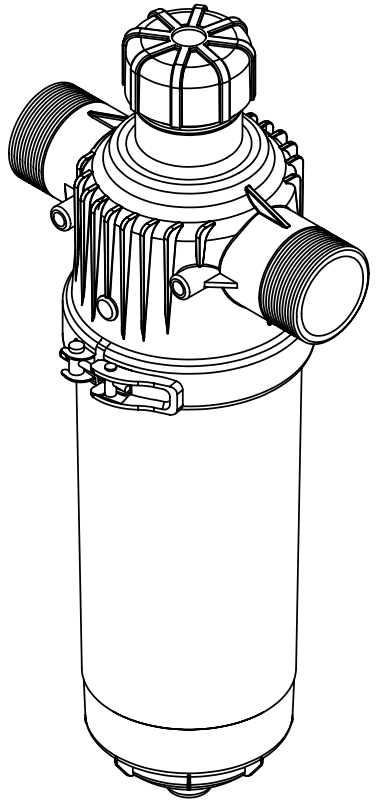


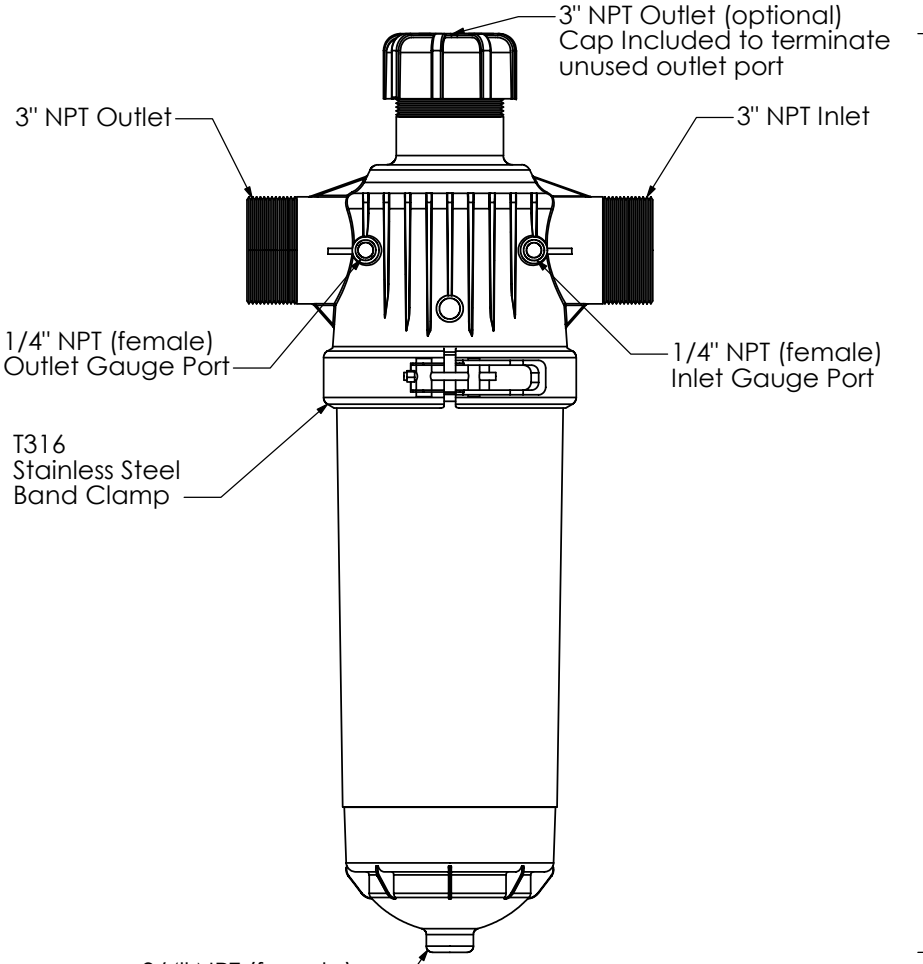


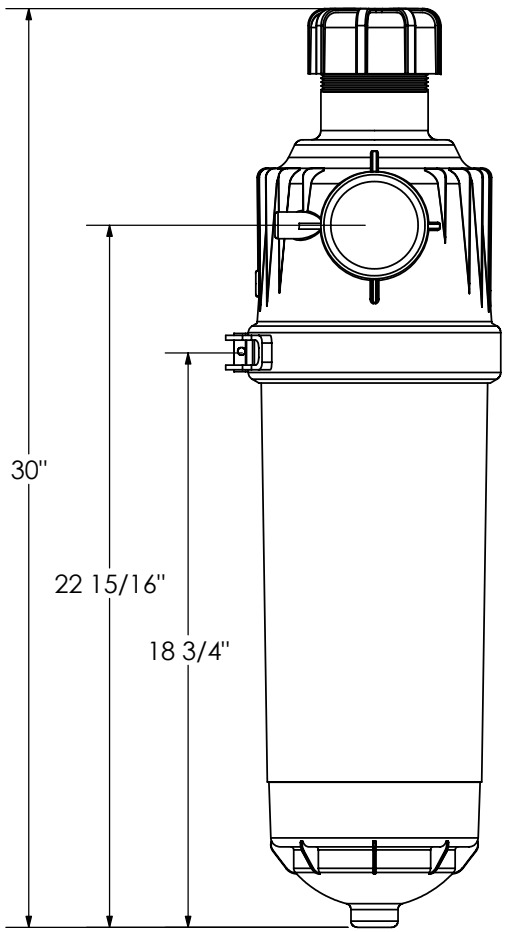
PRODUCT SPECIFICATION	DRAWN	S. Richards	9/26/03	TITLE
	CHECKED			2SA Helix Filter Housing
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED







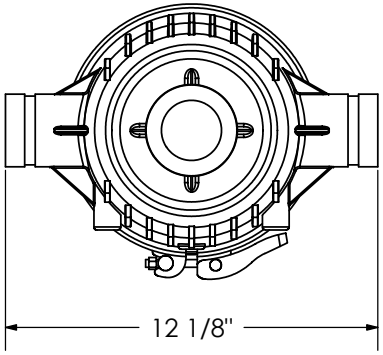


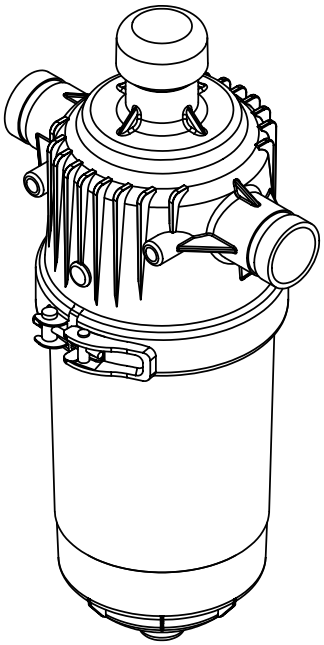
PRODUCT SPECIFICATION

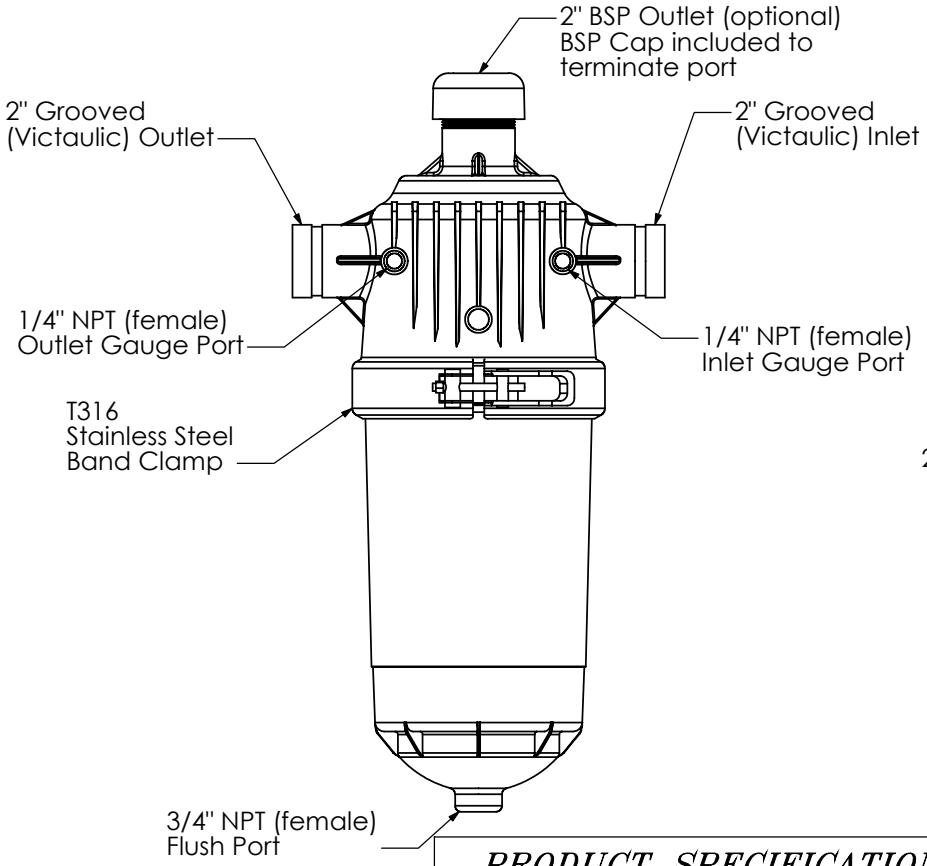
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

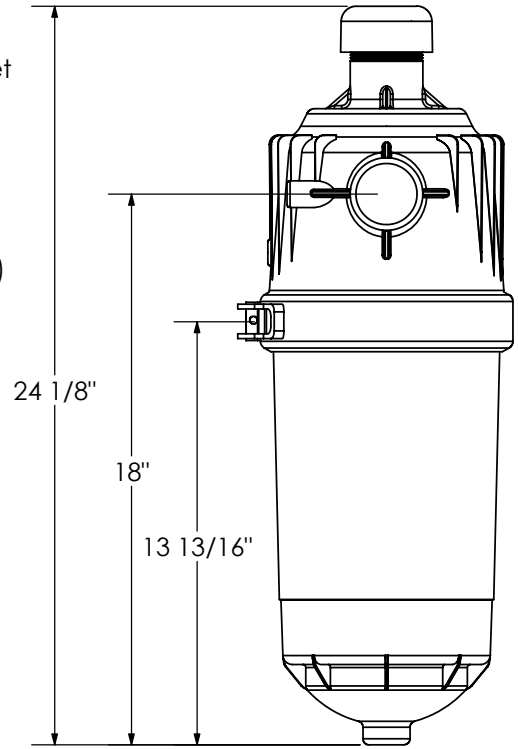
DRAWN	S. Richards	9/26/03	TITLE
CHECKED			3NA Helix Filter Housing
ENG APPR.			
MKT APPR.			
SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED



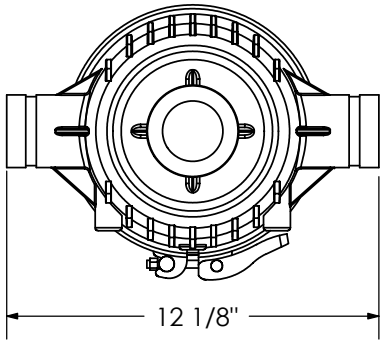


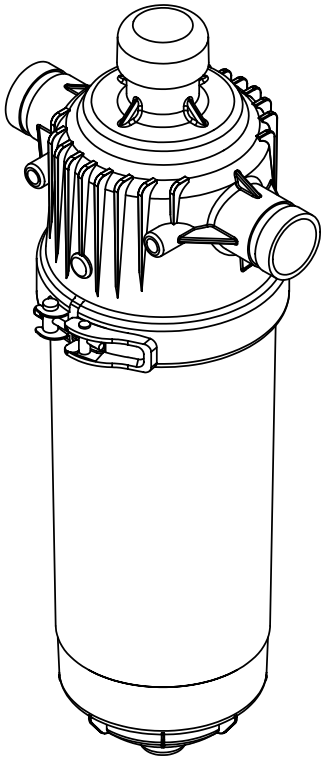


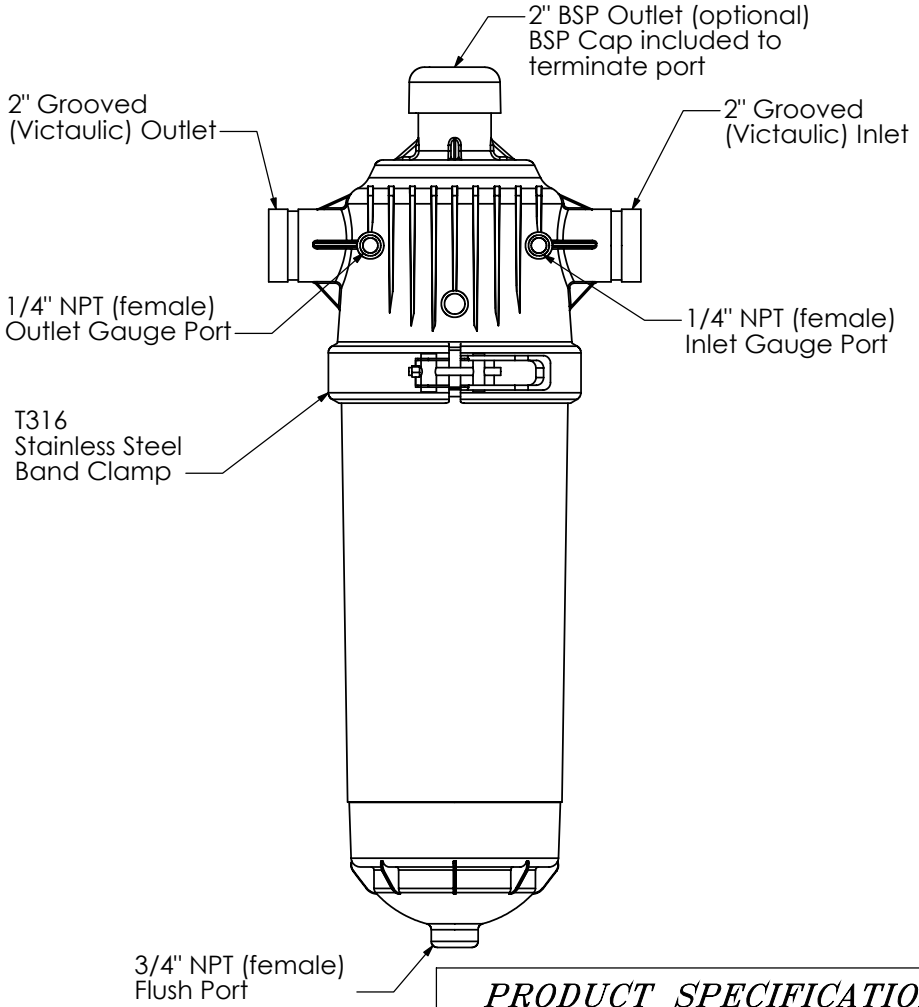


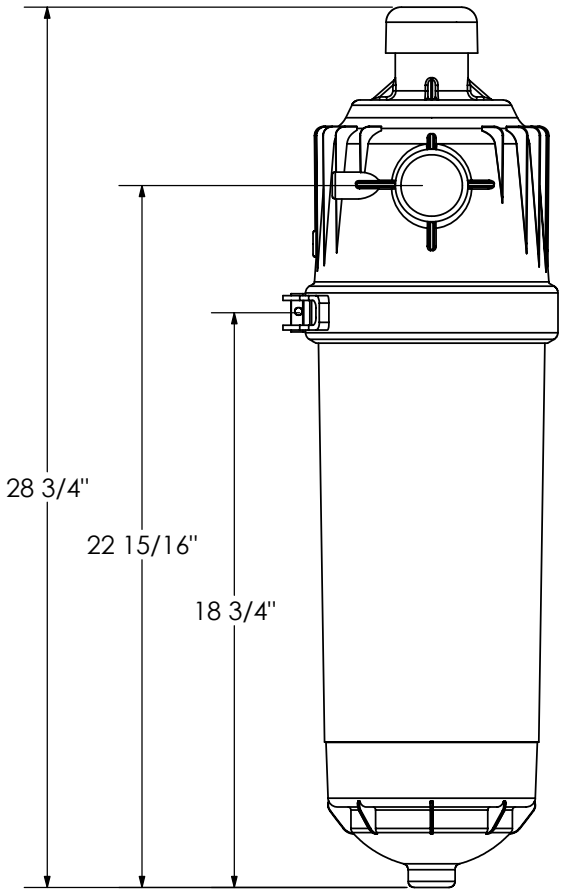
PRODUCT SPECIFICATION	DRAWN	S. Richards	9/26/03	TITLE
	CHECKED			2NW Helix Filter Housing
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED









PRODUCT SPECIFICATION

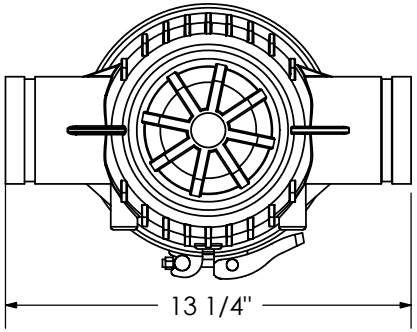
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

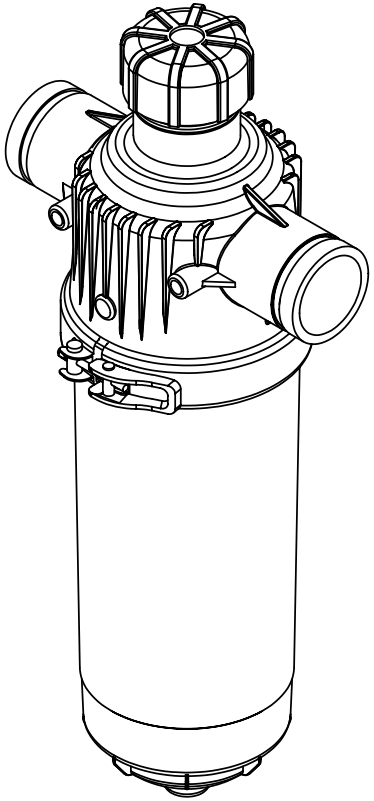
DRAWN	S. Richards	9/26/03
CHECKED		
ENG APPR.		
MKT APPR.		
SHEET 1 OF 1		

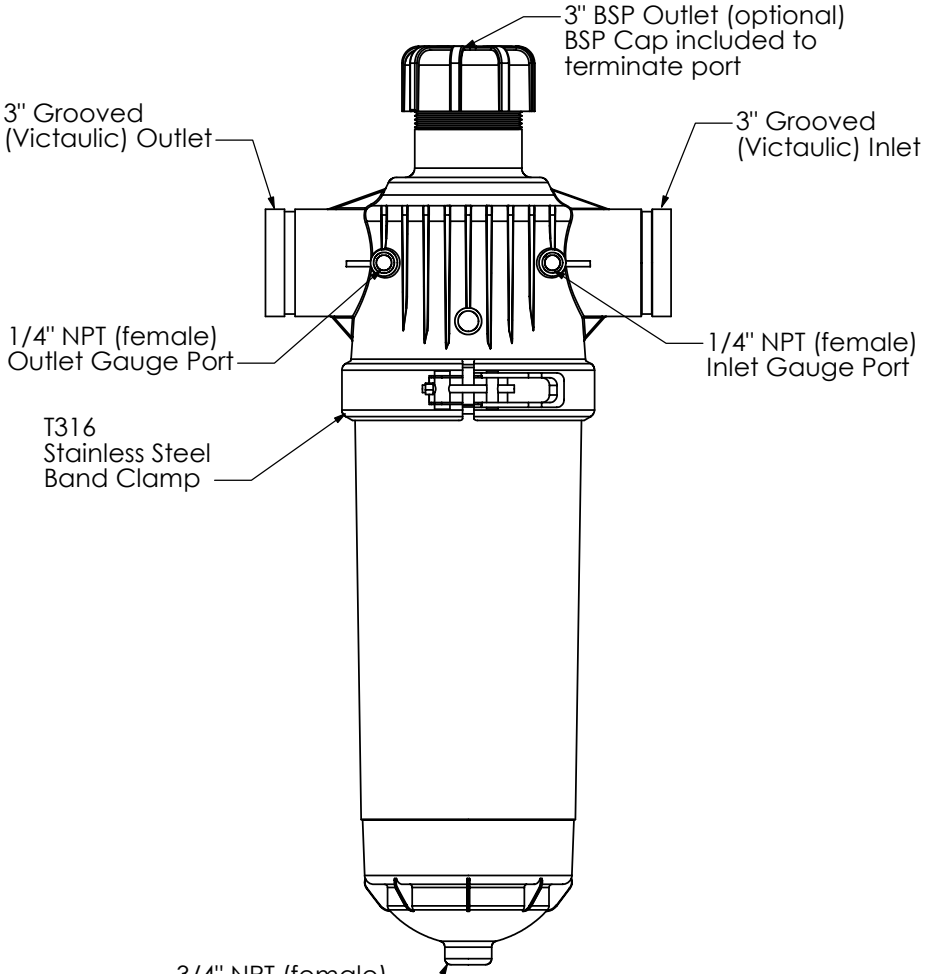
TITLE

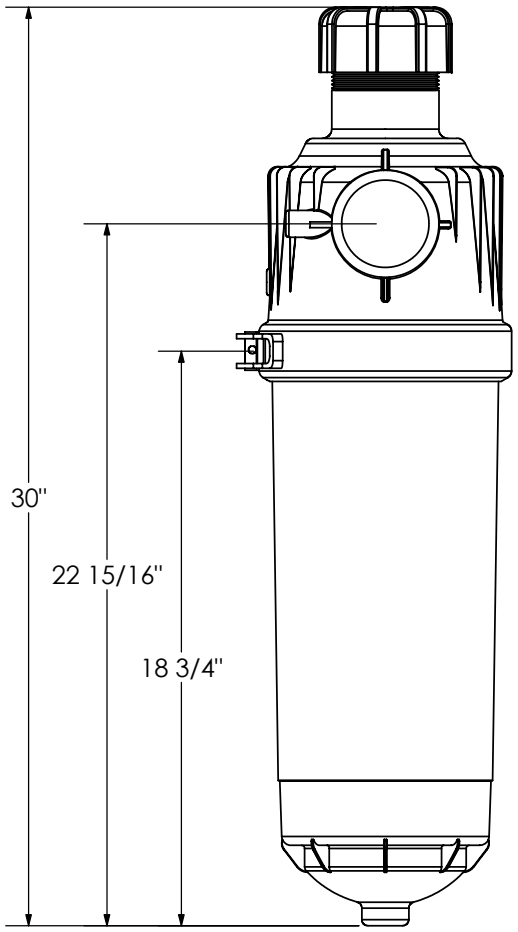
2SW Helix Filter Housing

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED







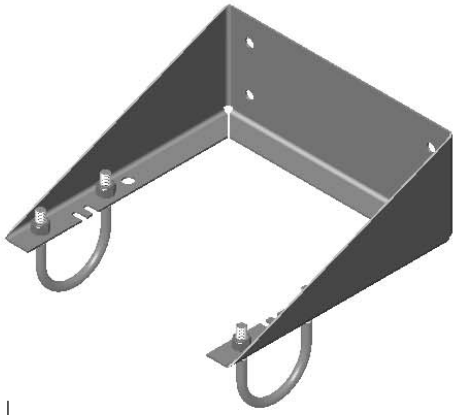


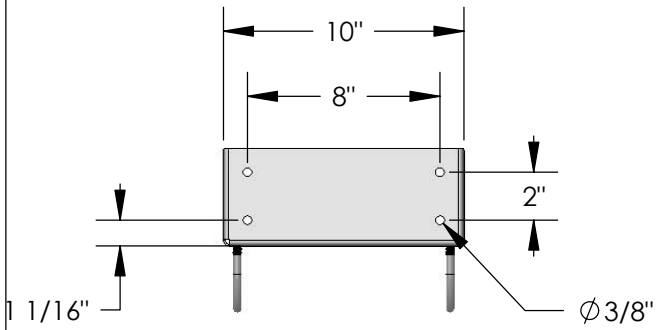
PRODUCT SPECIFICATION

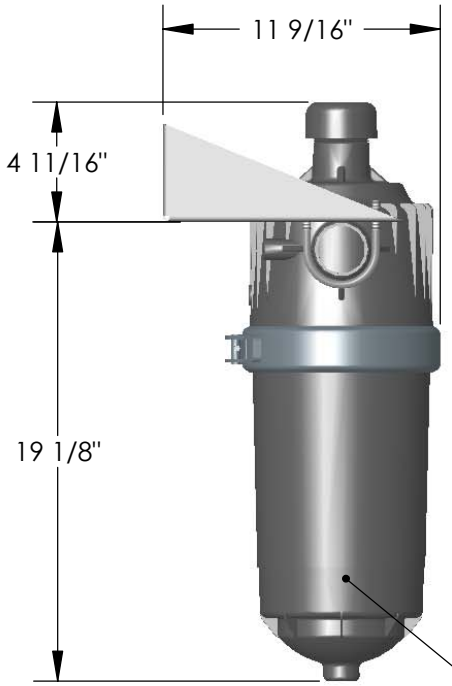
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

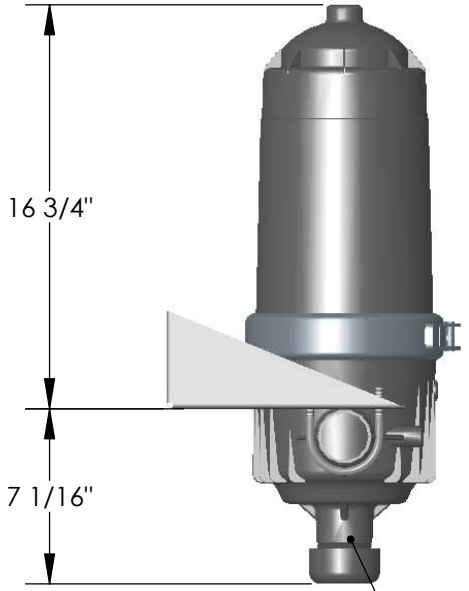
DRAWN	S. Richards	9/26/03	TITLE
CHECKED			3NW Helix Filter Housing
ENG APPR.			
MKT APPR.			
SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED









Filter Housing mounted to bracket in upright position. Housing shown for reference only.

Filter Housing mounted to bracket in standard position (flush port at bottom). Housing shown for reference only.

PRODUCT SPECIFICATION

MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

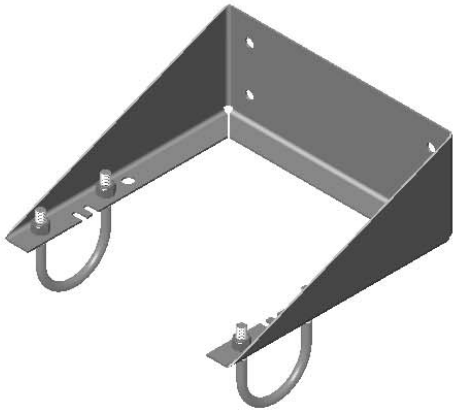
DRAWN	S. Richards	9/5/03
CHECKED		
ENG APPR.		
MKT APPR.		

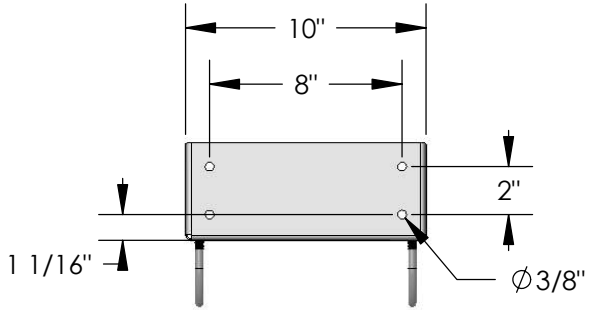
SHEET 1 OF 1

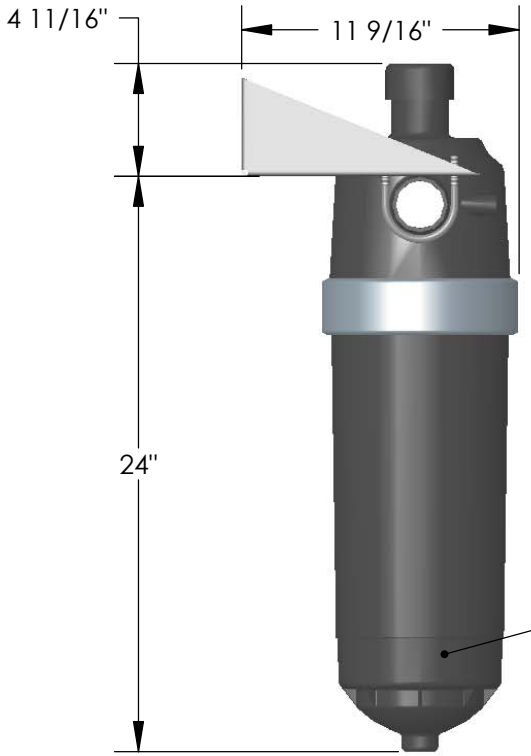
TITLE

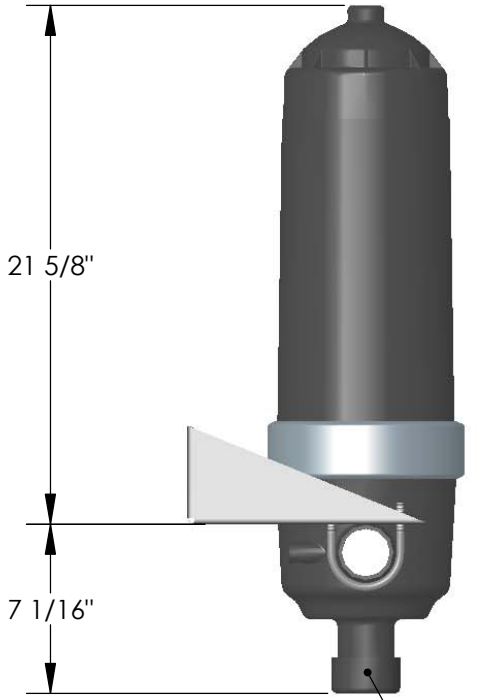
Mounting Bracket, T304 SS for 2" Helix

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED







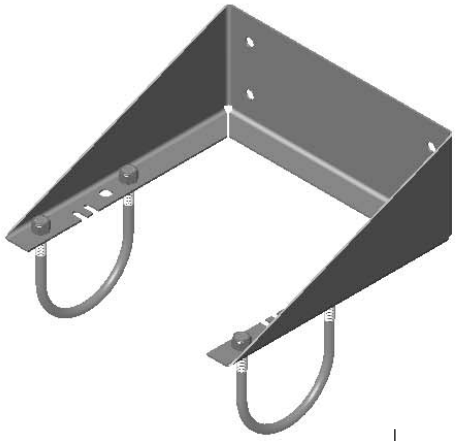


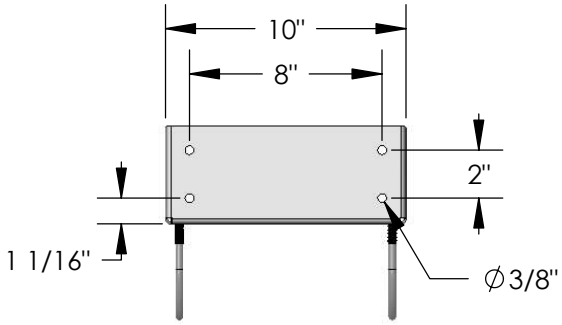
Filter Housing mounted to bracket in upright position. Housing shown for reference only.

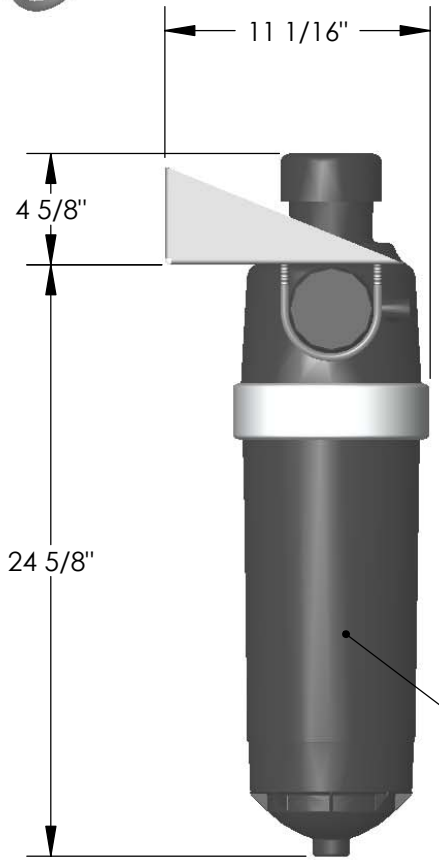
Filter Housing mounted to bracket in standard position (flush port at bottom). Housing shown for reference only.

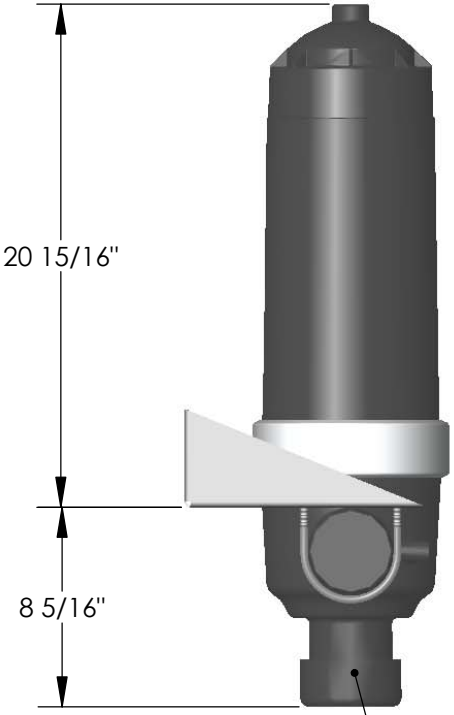
PRODUCT SPECIFICATION	DRAWN	S. Richards	9/5/03	TITLE
	CHECKED			Mounting Bracket, T304 SS for 2" Super Helix
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED









Filter Housing mounted to bracket in upright position. Housing shown for reference only.

Filter Housing mounted to bracket in standard position (flush port at bottom). Housing shown for reference only.

PRODUCT SPECIFICATION	DRAWN	S. Richards	9/5/03	TITLE
	CHECKED			Mounting Bracket, T304 SS for 3" Helix
MILLER-LEAMAN INC.	ENG APPR.			
800 Orange Ave. Daytona Beach FL 32114	MKT APPR.			
	SHEET 1 OF 1			

HELIX FILTER

HD SERIES — HELIX DISC FILTER
HS SERIES — HELIX SCREEN FILTER/STRAINER

OWNER'S MANUAL
INSTALLATION AND OPERATION GUIDE

MILLER-LEAMAN, INC.
800 Orange Avenue / Daytona Beach, FL 32114
(386) 248-0500 / (386) 248-3033 FAX
Email: sales@millerleaman.com
Web Site: www.millerleaman.com

Record in the space below the serial number of your filter. The serial number is located on the data plate decal on the face of the housing.

SERIAL # _____

IMPORTANT

Please make certain that persons who are to use this filter thoroughly read and understand these instructions prior to operation. Should you have any questions regarding the operation of this filter, please call (386) 248-0500 and ask to speak with one of our customer service representatives, or email us at sales@millerleaman.com .

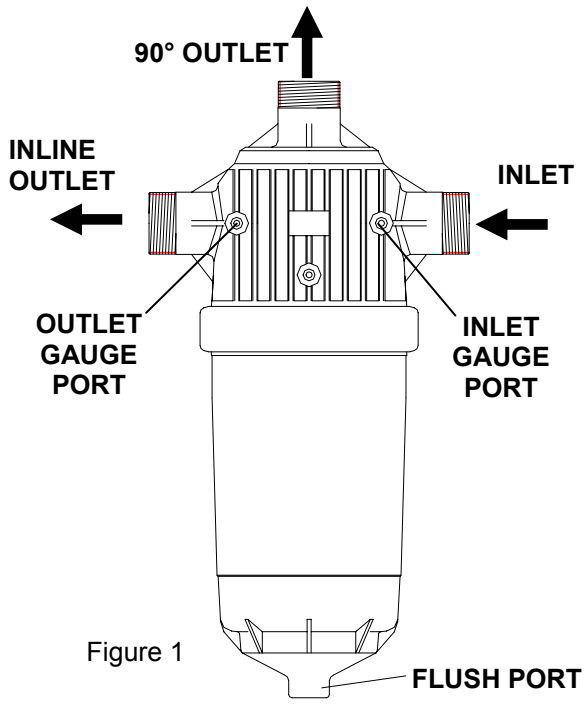


Figure 1

I. SAFETY CONSIDERATIONS

Safety precautions are essential when any filtration equipment is involved. These precautions are necessary when using, storing, and servicing your filter. If safety precautions are overlooked or ignored, personal injury or product damage may occur.

Your filter was designed for specific applications. It **should not** be modified and/or used for any application other than originally specified. If there are any questions regarding its application or installation, write or call Miller-Leaman, Inc.

NOTE CONCERING CLEAR POLYCARBONATE COVERS: Clear covers should be used for demonstration and intermittent use only. Clear covers will degrade in sunlight. If any cracks or fractures are observed in the clear cover discard cover immediately.

ALWAYS OBSERVE THE FOLLOWING PRECAUTIONS:

1. Read this manual carefully. Consider the applications, limitations, and the potential hazards specific to your filter.
2. **Absolutely, under no conditions, should the filter clamp/lid or pressure gauges be removed while the filter is pressurized.**
3. Units with damaged or missing parts should **never** be operated. Contact our customer service representatives for replacement parts.
4. Pressure relief valves of a sufficient size and volume should be installed upstream of the inlet and downstream of the outlet of the filter. They should be set to relieve pressure at 1.2 times your maximum operating pressure (not to exceed the maximum rated pressure of 125 PSI). This will help to prevent injury and damage to the filter housing and filter disc/screen cartridge if severe stoppage or water hammer occurs.

AT NO TIME SHOULD THE INTERNAL PRESSURE EXCEED THE MAXIMUM RATED PRESSURE FOR YOUR FILTER

II. INSTALLATION

Please review the following checklist. When all tasks are complete the filter is ready to be used.

1. Your Helix Filter is equipped with (1) inlet and (2) outlet connections. Choose either the In-Line outlet or the 90 degree configuration and terminate the outlet port not being used with the supplied pipe cap. ***The preferred orientation of installing the Helix Filter is with the flush port pointing downward (fig. 1); however, the filter can also be installed with the 3/4" connection pointing upward.***

2. Fasten inlet and outlet connection securely to system piping. Arrows on the filter housing clearly depict flow direction.
3. We recommend the installation of a quick pressure relief valve upstream of the inlet and downstream of the outlet of the filter. Set the valves to relieve pressure at 1.2 times your maximum operating pressure (not to exceed the maximum rated pressure of 125 PSI). Installation of these valves will prevent injury and damage to the filter if severe clogging or water hammer occurs.
4. Install a valve on the flush port located at the bottom of the removable filter lid (fig. 2).
5. Install threaded pressure gauges into the inlet and outlet gauge ports located on the side of the filter (E & F, fig. 2).
6. Before start up, make sure the filter lid and stainless steel band-clamp are securely fastened.

III. FILTER OPERATION

Once installed, dirty liquid flows into the filter housing through the inlet connection and will pass through the Helix Element which creates a centrifugal action. This action spins the particles away from the filter media minimizing the manual cleaning frequency. As particles are spun down to the base of the filter, they are flushed via the 3/4" female threaded flush port connection. The dirty water passes from the outside to the inside of the filtration cartridge which will capture the remaining contaminants in the water. After passing through the filtration cartridge the filtered water flows upward and exits the filter through one of the outlets. The outlet not being used is terminated with a threaded cap.

(Note: After operation, open the flush port to allow the water/liquid contained in the filter body to drain. If there is non-compatible chemical content in the water, it may degrade or swell the plastic. Also, in winter months, the water may freeze and expand putting unnecessary stress on the filter body.)

If the inlet pressure gauge displays a pressure reading 10-15 PSI greater than the outlet pressure gauge, flow to the filter must be terminated and the filtration cartridge must be inspected as per section IV, Filtration Cartridge Maintenance.

IV. FILTRATION CARTRIDGE MAINTENANCE

CAUTION: DO NOT OPEN UNDER PRESSURE. REMOVE ALL PRESSURE FROM THE FILTER BY SHUTTING THE SYSTEM DOWN OR ISOLATING THE FILTER FROM THE OPERATING SYSTEM. OPEN DRAIN/FLUSH PORT TO RELIEVE PRESSURE AND DRAIN LIQUID FROM FILTER HOUSING. DO NOT ATTEMPT TO SERVICE THE FILTER UNTIL THE PRESSURE IS RELIEVED.

Step 1: Terminate flow to the system and open flush port. Pressure gauges mounted on the filter housing must read zero.
Step 2: Unlatch the band clamp assembly and remove the filter lid.
Step 3: Remove the filter cartridge from the filter body. The filtration cartridge seats tightly into the filter body. If necessary, rock the cartridge gently from side to side to facilitate removal.
Step 4: Rinse the exterior of the cartridge to remove any loose debris on the exterior surface of the discs/screen.
Step 5: Cleaning instructions for the Helix HD and HS series filters. (See Below)

HD Series – DISC Filter

Unscrew the threaded wing bolt until bolt and cartridge cover plate are loose. Do not remove the wing bolt from the filtration cartridge. The filtration discs will be loose and can freely move on the filtration cartridge frame. Rinse the filtration discs until all contaminants are removed. Restack the discs onto the cartridge frame, position the cover plate and retighten the threaded wing bolt, hand tighten only. **IMPORTANT: Be sure all particulate has been thoroughly rinsed from between the discs. Particles caught between discs could affect filtration integrity.**

HS Series – SCREEN Filter

Unscrew the threaded wing bolt until bolt and cartridge cover plate are loose. Remove the wing bolt from the filtration cartridge and the screen cartridge can be removed from the filtration cartridge frame. Use a nylon brush while rinsing to remove debris/particles from the outside of filtration screen. Replace the screen back onto the cartridge frame, reposition the cover plate and retighten the threaded wing bolt, hand tighten only.

Step 6: Reposition the filtration cartridge into the filter body. Push firmly to seat the o-ring on the cartridge into the filter body.
Step 7: Securely fasten the filter lid to the housing with the stainless steel band clamp.

V. INFORMATION CONCERNING WATER HAMMER

WHAT IS WATER HAMMER?

Water hammer is a phenomenon that can occur in fluid systems with long pipes between the fluid source and the fluid system outlet. The term itself refers to the sound made when water hammer occurs which resembles banging a hammer on a long pipe. Water hammer is a rapid change of pressure caused by a rapid change in velocity. When the velocity is changed a pressure wave that travels at the speed of sound is initiated and travels in the upstream direction until it reaches some stationary energy level, like a reservoir. A rarefaction wave (at the pressure of the water source) then travels downstream at the same speed. If the flow has been shut off down-stream the pressure wave impacts the blockage and the pressure in the entire system is raised very rapidly.

WHAT CAUSES WATER HAMMER?

Any action that can cause a rapid change in the velocity of the flow can initiate water hammer - closing a downstream valve, pipe fracture, pump stoppage, etc. The critical time for which a valve may be closed depends on the length of piping between the valve and the source reservoir. The longer the distance the slower the valve may be shut to cause a water hammer. Typically for short lengths of pipe (below 500 ft) the critical time is less than 1/10 of a second.

WHAT CAN WATER HAMMER DO?

Pressure spikes from water hammer can raise fluid pressures to very high values (in excess of 1000 PSI depending on the situation). Such pressure spikes can result in mechanical failures such as broken valves, pipes, filters, joints, etc. Water hammer does not have to occur fully to raise the pressure. A partial hammer can occur that raises the pressure to a certain percentage of the theoretical maximum. The *Helix Filter* is rated to a maximum pressure of 125 PSI. A water hammer pressure spike that raises the pressure higher than the maximum rated pressure may result in injury and/or damage to filter housing and filter cartridge.

FAILURE TO FOLLOW INSTRUCTIONS AND WARNINGS CAN RESULT IN SERIOUS BODILY INJURY.

WHAT CAN I DO TO PREVENT WATER HAMMER?

There are precautions that can be taken to prevent or decrease the effect of water hammer. A pressure relief valve that leads to a surge tank or accumulator may protect other key components from water hammer. A close adherence to operational policies will also help prevent valves or pumps from being accidentally shut off thereby causing a water hammer. A close examination of a system will inform you where potential hazards exist.

VI. LIMITED WARRANTY

1) Duration:

Filter Disc/Screen Cartridge: Ninety days from the date of purchase by the original purchaser (other than for purposes of resale).

Filter Housing & all other components: One year from the date of purchase by the original purchaser.

2) Who gives this warranty (Warrantor)

Miller-Leaman Incorporated

800 Orange Avenue; Daytona Beach, FL 32114

3) Who receives this warranty (Purchaser):

The original purchaser (other than for purposes of resale) of the Miller-Leaman product.

4) What products are covered by this warranty:

Any Miller-Leaman *Helix* housing and filter cartridges manufactured or sold by the warrantor.

5) What is covered under this warranty:

Defects on materials and workmanship, which occurs within the duration of the warranty period.

6) What is not covered under this warranty:

A) Implied warranties, including those of merchantability and fitness for a particular purpose, are limited to one year from the date of original purchase. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

B) Any incidental, indirect, or consequential loss, damage, or expense that may result from any defect, failure, or malfunction of the Miller-Leaman product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

C) Any failure that results from an accident, purchaser's abuse, neglect, or failure to operate the product in accordance with the instructions provided in the owner's manual supplied with the product.

D) Items or service that are normally required to maintain the product, i.e. gaskets.

7) Responsibilities of warrantor under this warranty:

Repair or replace, at warrantor's option, products or components which have failed within the duration of the warranty period.

8) Responsibilities of purchaser under this warranty:

A) Deliver or ship the warranted product to the Miller-Leaman manufacturing facility. Freight costs, if any, must be borne by the purchaser.

B) Use reasonable care in the operation and maintenance of the product as described in the owner's manual.

9) When the warrantor will perform repair or replacement under warranty.

A) Repair or replacement will be scheduled and serviced according to the normal workflow at the manufacturing facility, and depending on the availability of replacement parts.

B) If the purchaser does not receive satisfactory results from the product repair or replacement, the purchaser shall contact Miller-Leaman immediately.

<u>NOTE:</u> THIS WARRANTY IS VOID IN THE EVENT THE PURCHASER FAILS TO COMPLY WITH ANY ONE OF THE REQUIREMENTS FOR INSTALLATION AND USE OUTLINED OR SET FORTH IN THIS MANUAL AND MILLER-LEAMAN INCORPORATED ASSUMES NO LIABILITY WHAT-SO-EVER.

This Limited Warranty gives you specific legal rights and you may also have other rights which vary from state to state.

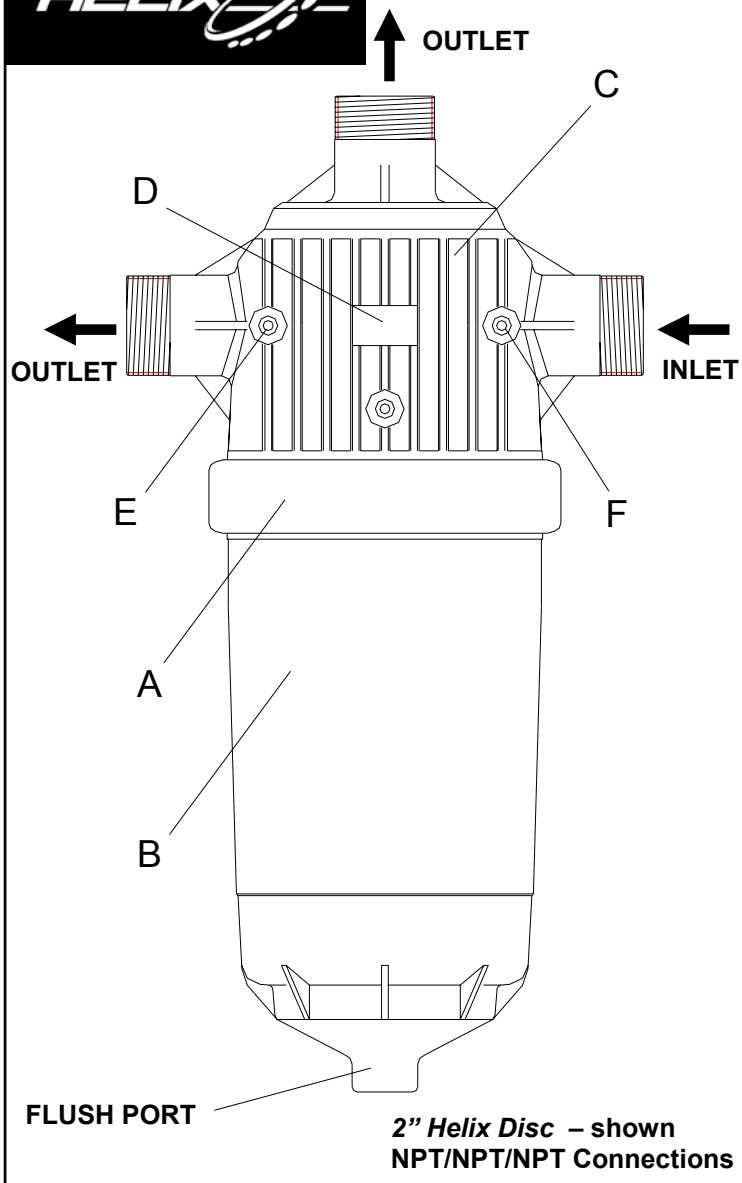


Figure 2

HELIX FILTER

Components:

See Diagram to the Left:

A. Band-Clamp Assembly
B. Removable Filter Lid
C. Filter Body
D. Mesh/Micron Data Plate
E. Outlet Gauge Port (Clean Water Side)
F. Inlet Gauge Port (Dirty Water Side)

HELIX FILTER CARTRIDGES

Components:

See the Diagram Below:

G. Screen Cartridge / Disc Cartridge
H. *Helix* Element
I. O-Ring Seal
J. Threaded Wing Bolt (Hand Tighten)
K. Cartridge Cover Plate

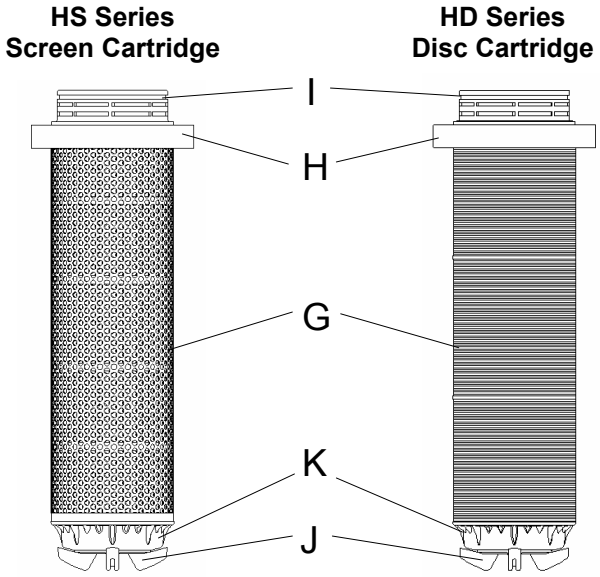


Figure 3

COMPANY INFORMATION

MILLER-LEAMAN, INC.

800 Orange Avenue, Daytona Beach, FL 32114

Phone: (386) 248-0500 / Fax: (386) 248-3033

www.millerleaman.com

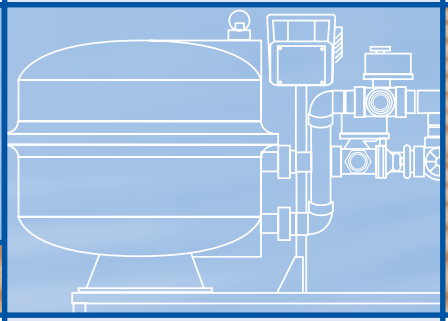
email: sales@millerleaman.com

Hours: M-F 8:00 AM - 5:00 PM Eastern USA

TowerGuard Sand Media Filter
Informaton & Owner's Manual

TOWER GUARD
SAND MEDIA FILTER

FOR SIDE-STREAM COOLING TOWER APPLICATIONS

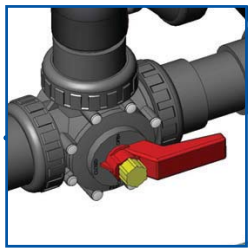


The TowerGuard side-stream sand filter series represents Miller-Leaman's newest generation of self-cleaning cooling tower water filtration products.

The skid mounted TowerGuard filter system automatically removes particles introduced to your system from the air scrubbing action of the cooling tower as well as particles present in the cooling tower make up water. Keeping your system free of these particles will reduce maintenance costs by keeping your cooling tower basin, heat exchanger tubes, and system piping clean. In addition, you will see an improvement in heat exchange efficiency resulting in lower energy costs. The TowerGuard utilizes a specialized granular filter media, providing particle removal approaching at the 10-micron level.

Available in a 44 GPM, 62 GPM, and 98 GPM model size, the TowerGuard filters come complete with a robust 2-piece fiberglass reinforced vessel rated at 50 PSI, a close coupled Type 316 stainless steel centrifugal pump with a TEFC motor, all mounted on a heavy-duty Type 304 stainless steel skid.

Miller-Leaman's compact, yet powerful Maxim backwash controller provides for complete control of the filter system, enabling the backwash cycle to be triggered manually, on differential pressure, or elapsed time.



All TowerGuard systems offer the versatility of backwashing with tower/source water or city/external water. This is accomplished by a turn of the backwash selector valve and a simple menu change in the Maxim controller.

The skid mounted system arrives completely assembled, pre-wired with a single-point electrical connection, and loaded with sand. Our innovative TowerGuard systems are value engineered to deliver superior performance and long-term reliability.

SYSTEM FEATURES:

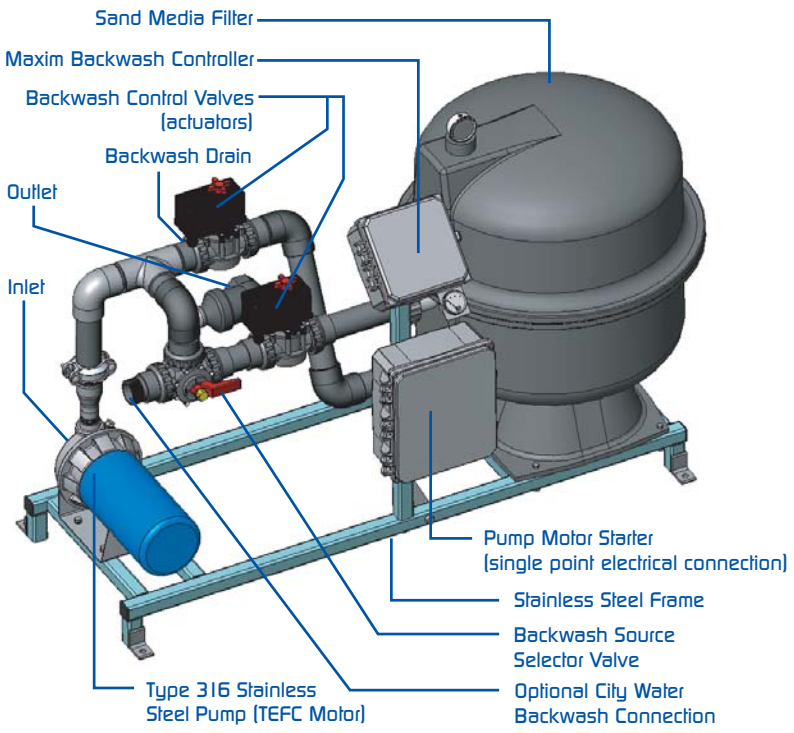
- Particle removal down to 10-micron
- Robust fiberglass reinforced polyester vessel
- Corrosion resistant, electrically-actuated PVC 3-way valves
- Type 316 stainless steel pump with a TEFC motor, available in Single-phase and Three-phase
- Single-point electrical connection
- State-of-the-art user-adjustable Maxim backwash controller
- Optional backwashing with source water or city water
- System arrives completely assembled, loaded with sand, and factory tested

TYPICAL APPLICATIONS:

- Schools/Universities
- Hospitals
- Office Buildings
- Hotels
- Government Buildings
- Industrial Facilities

MILLER LEAMAN INC

superior quality



FILTER OPERATION MODES

Filtration:

Influent contaminated water flows through the pump and enters the filter. Water is distributed evenly over the sand media bed. As it flows down through the sand media, suspended particles are captured. Filtered effluent water exits into the system outlet. As particles are captured, a "caking effect" is achieved throughout the sand bed which results in finer particle removal.

Backwash:

Once the Maxim controller initiates a backwash, the flow path is reversed through the filter by two 3-way valves. During backwash, the water is reversed through the media bed. The reverse flow of water causes the media bed to lift, allowing the captured particles to release and wash out the backwash drain pipe. Backwashing can be done with source water or city water.

FILTER COMPONENTS

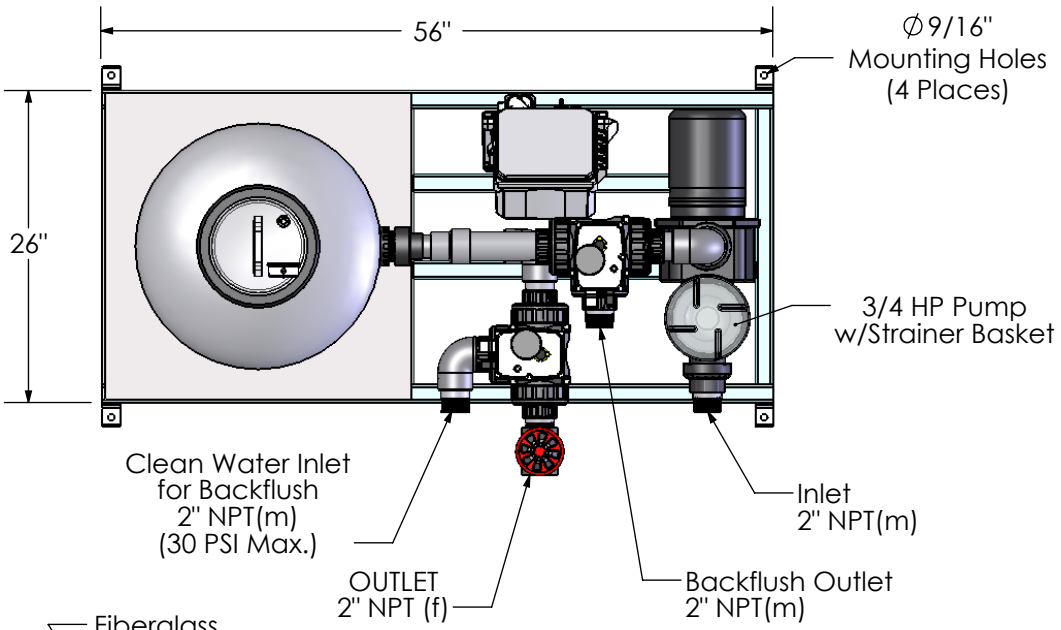
- Vessel: Fiberglass Reinforced Polyester (FRP)
- Internal Distribution Piping: PVC
- Face Piping: Schedule 80 PVC
- Filter Media: Unigran-85 (10 micron)
- Pump: Close Coupled TEFC Motor, System Matched Type 316 Stainless Steel Centrifugal Pump
- Control Valves: PVC 3-Way Valves, Electrically Actuated
- Skid: 1.5" Type 304 Stainless Steel, Welded
- Controller: Maxim Backwash Controller with User-Adjustable Backwash Frequency and Duration in a NEMA-4X Enclosure. (Additional input/output capabilities are optional.)
- Electric: Single Point Electrical Connection Common VAC, complete with Motor Starter with Overload Protection and Reset Button

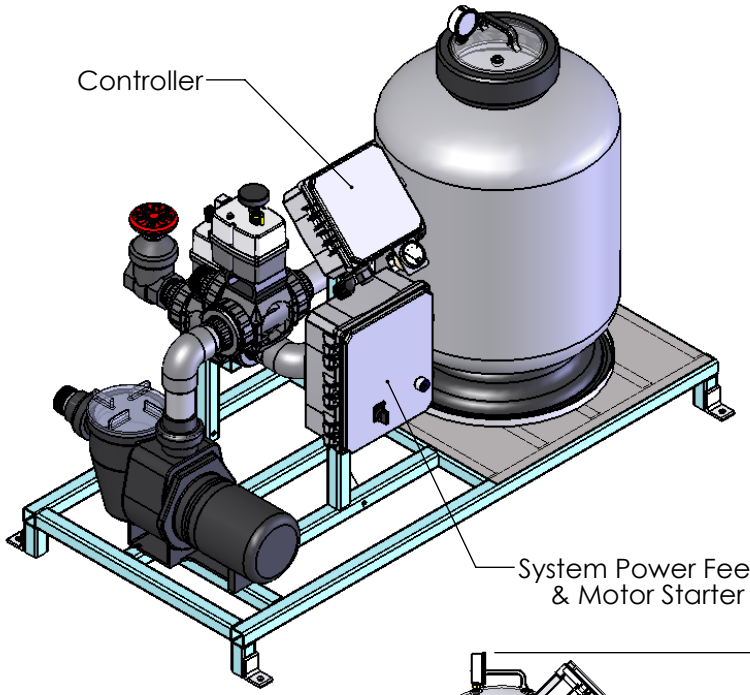
Model #	Flow Rate (GPM)*	Filtration Area (Sq. Ft.)	Max Pressure (PSI)	Inlet / Outlet Size and Type	Backwash Line Size and Type	Optional City Water Line Size and Type	Pump HP	System Voltage / Amps**
1 phase power systems / single line feed								
TG-20	44 GPM	2.2 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	1 HP	115 VAC (15 amps) 230 VAC (8 amps)
TG-24	62 GPM	3.1 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	1.5 HP	115 VAC (20 amps) 230 VAC (11 amps)
TG-30	98 GPM	4.9 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	2 HP	115 VAC (22 amps) 230 VAC (12 amps)
3 phase power systems / single line feed								
TG-20-3P	44 GPM	2.2 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	1 HP	208-230 VAC (5 amps) 460 VAC (3 amps)
TG-24-3P	62 GPM	3.1 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	1.5 HP	208-230 VAC (7 amps) 460 VAC (4 amps)
TG-30-3P	98 GPM	4.9 sq. ft.	50 PSI	Inlet: 1.5" NPT (f), Outlet: 2" NPT (f)	2" NPT (m)	2" NPT (m)	2 HP	208-230 VAC (8 amps) 460 VAC (5 amps)

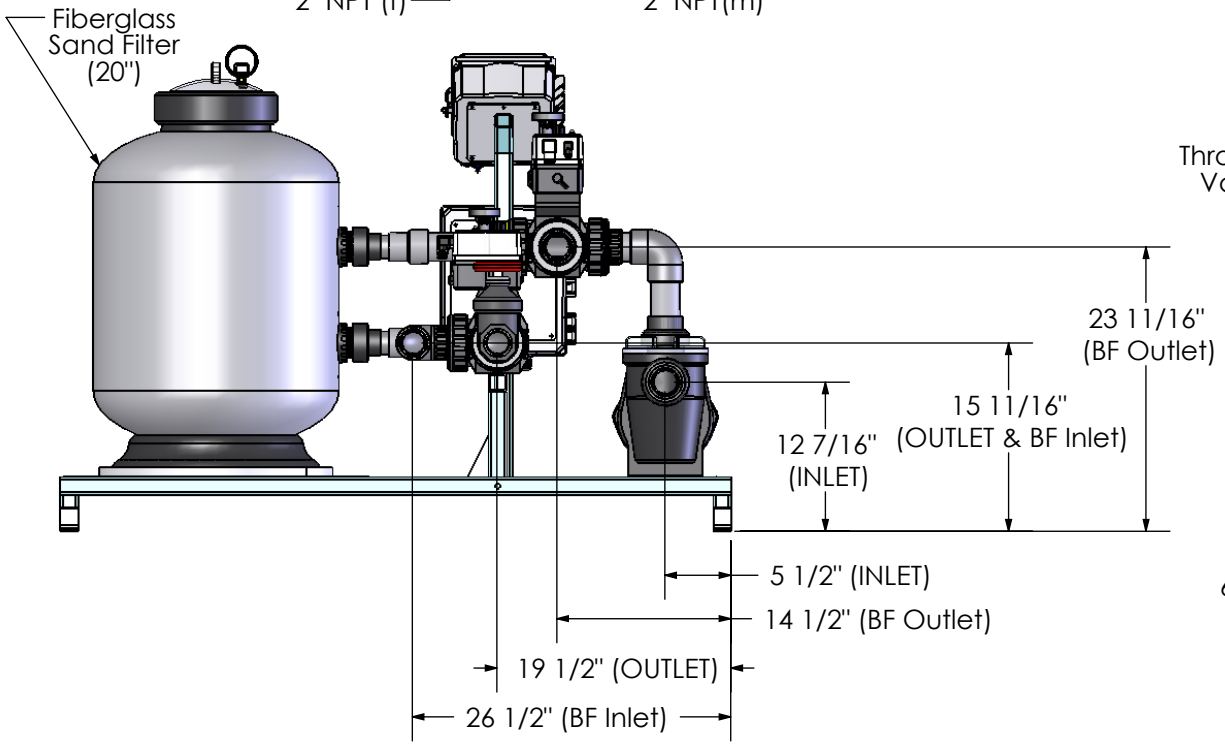
*Higher flow rate models available; contact factory for additional information.
**All systems come standard with single point electrical feed; electrical connection is at motor starter.

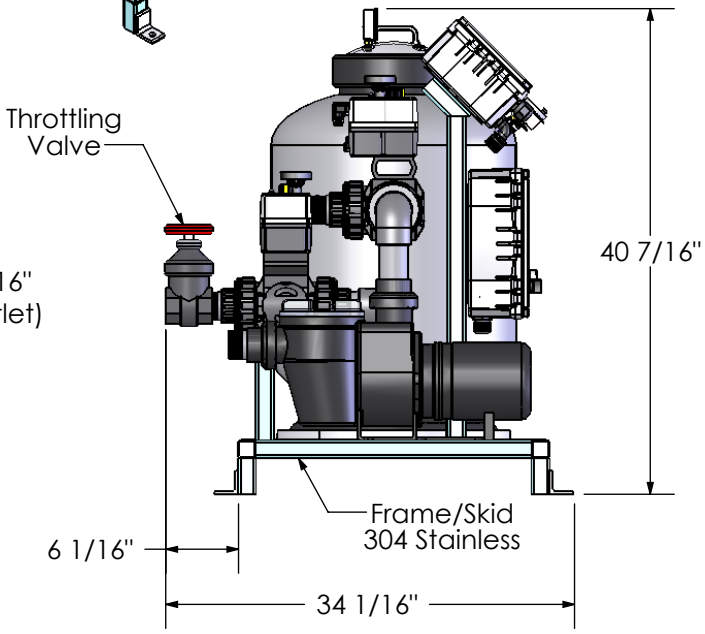
MILLER LEAMAN INC
800 Orange Avenue • Daytona Beach, FL 32114
phone: 386.248.0500 • toll free: 800.881.0320
fax: 386.248.3033 • www.millerleaman.com

Made in the U.S.A.









SYSTEM REQUIREMENTS

Electrical:
460 VAC, 3 Phase, 60 Hz, 3A
Maximum System Pressure: 50 PSI
Backflush Inlet Pressure: 30 PSI Max.

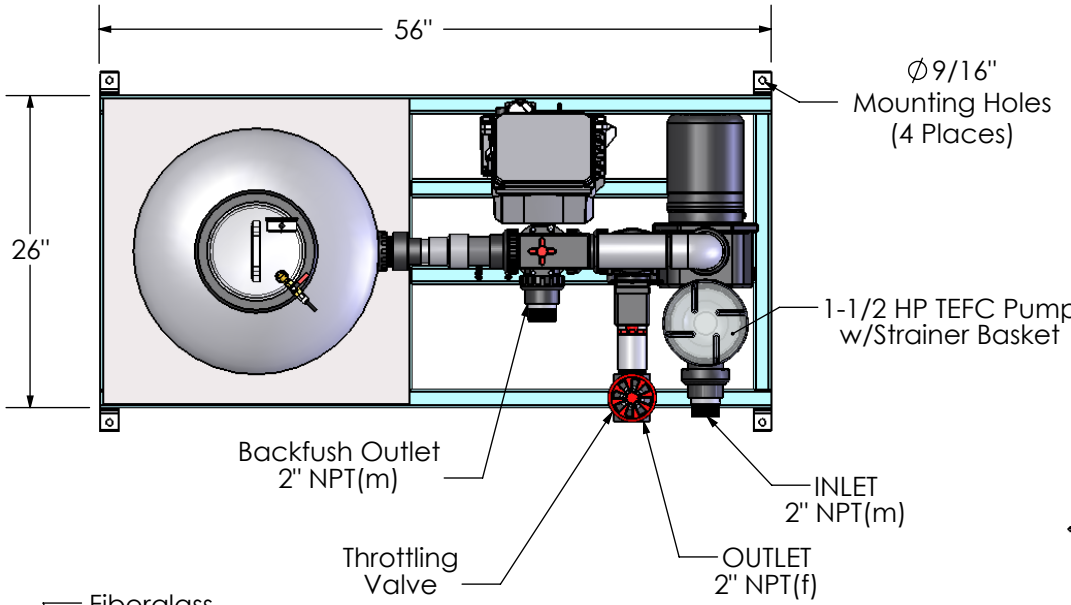
PRODUCT SPECIFICATION

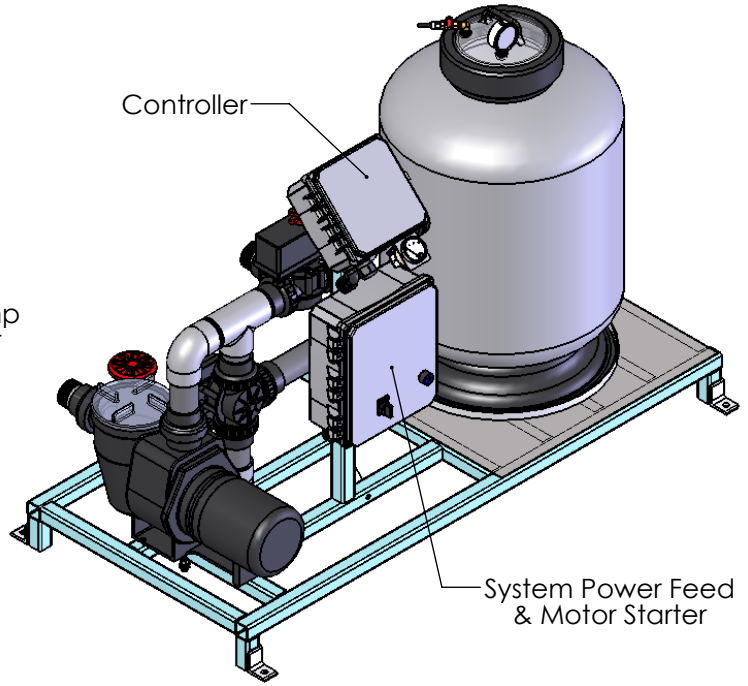
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

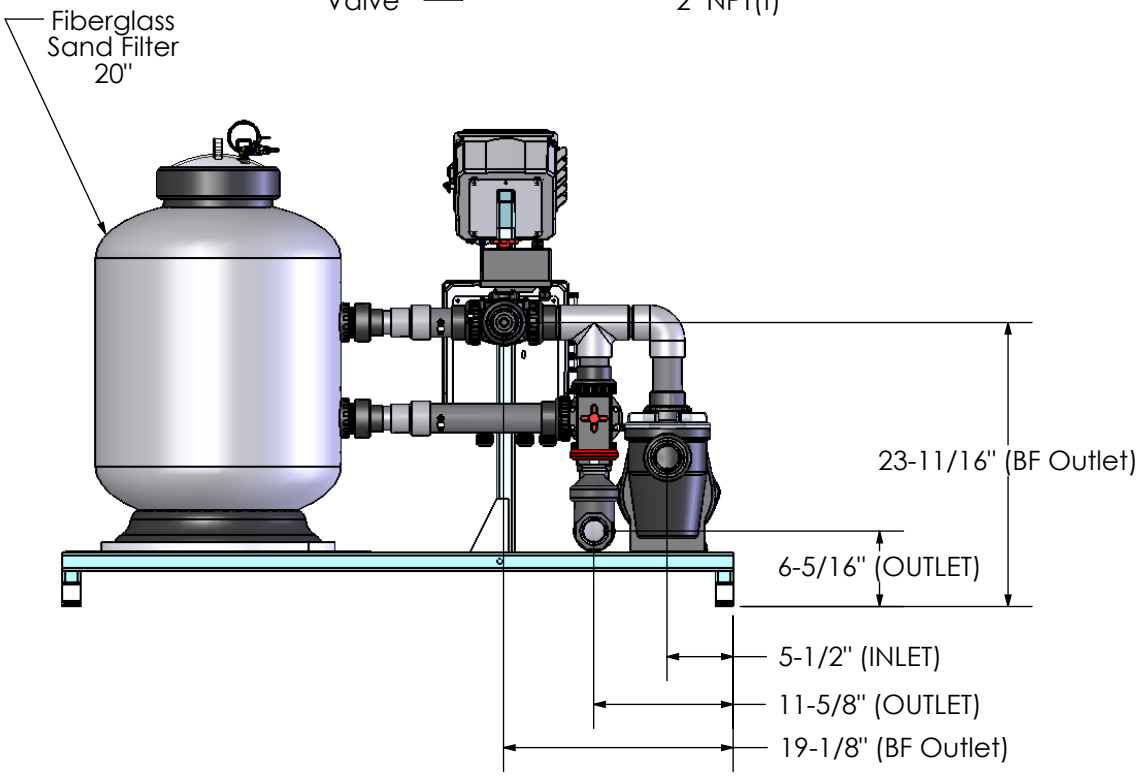
DRAWN	J. Larsen	12/9/08
CHECKED		
ENG APPR.		
MKT APPR.		

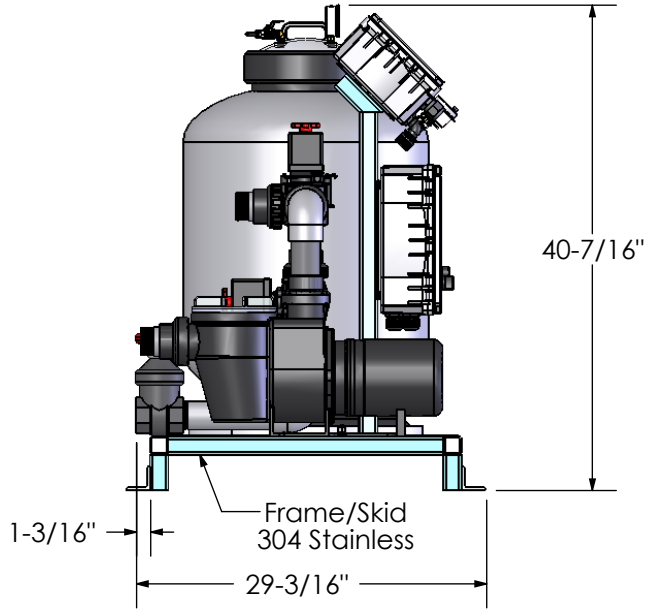
SHEET 1 OF 1

TITLE
TowerGuard TG-20C-3P
Automatic Sand Filter
Skid System









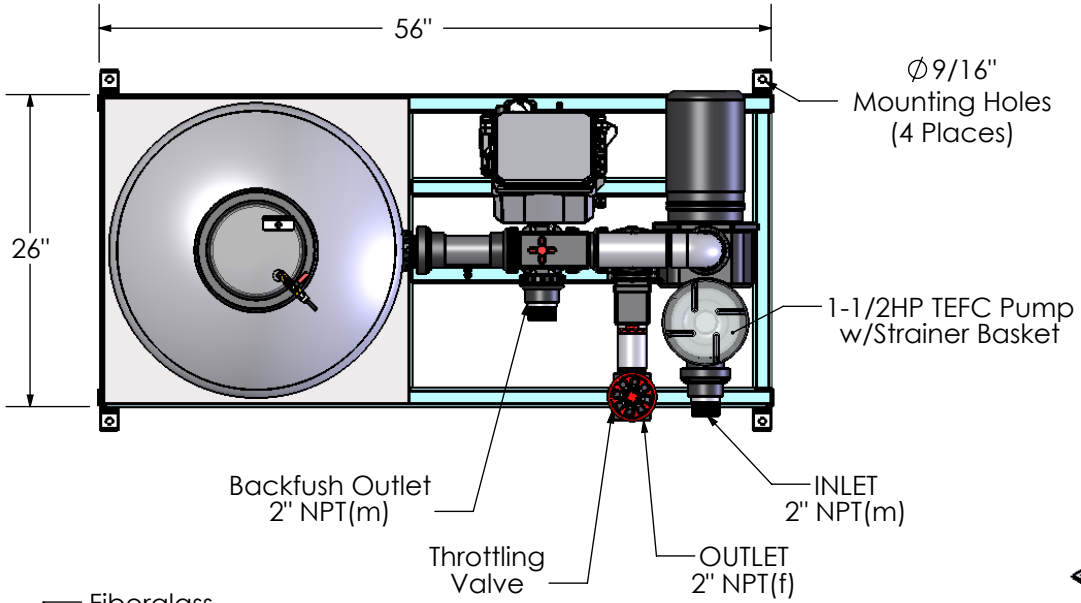
SYSTEM REQUIREMENTS

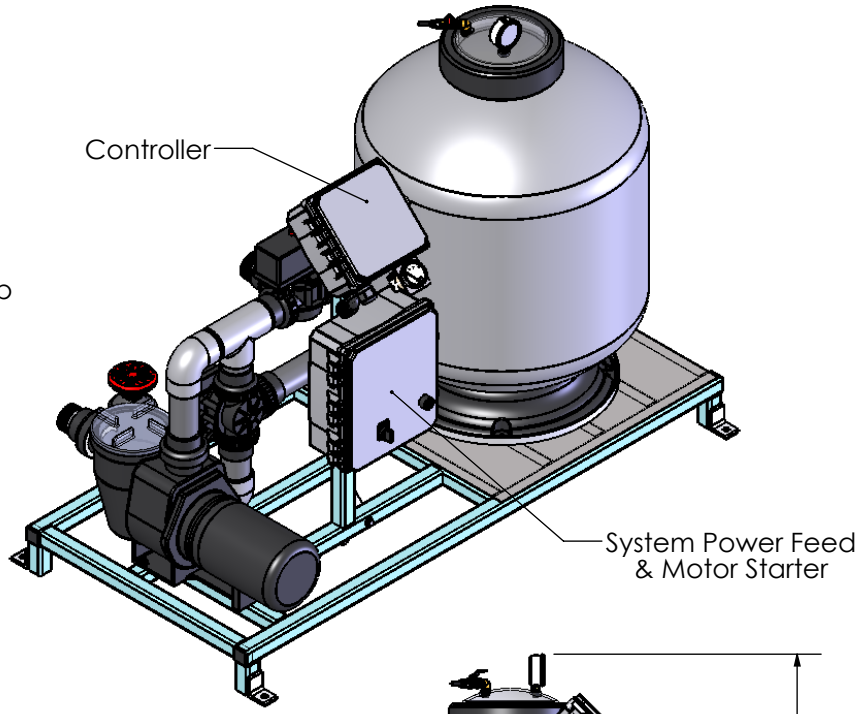
Electrical:
460 VAC, 3 Phase, 60 Hz, 3A
Water Supply Pressure: 10 PSI Max.
Maximum System Pressure: 50 PSI

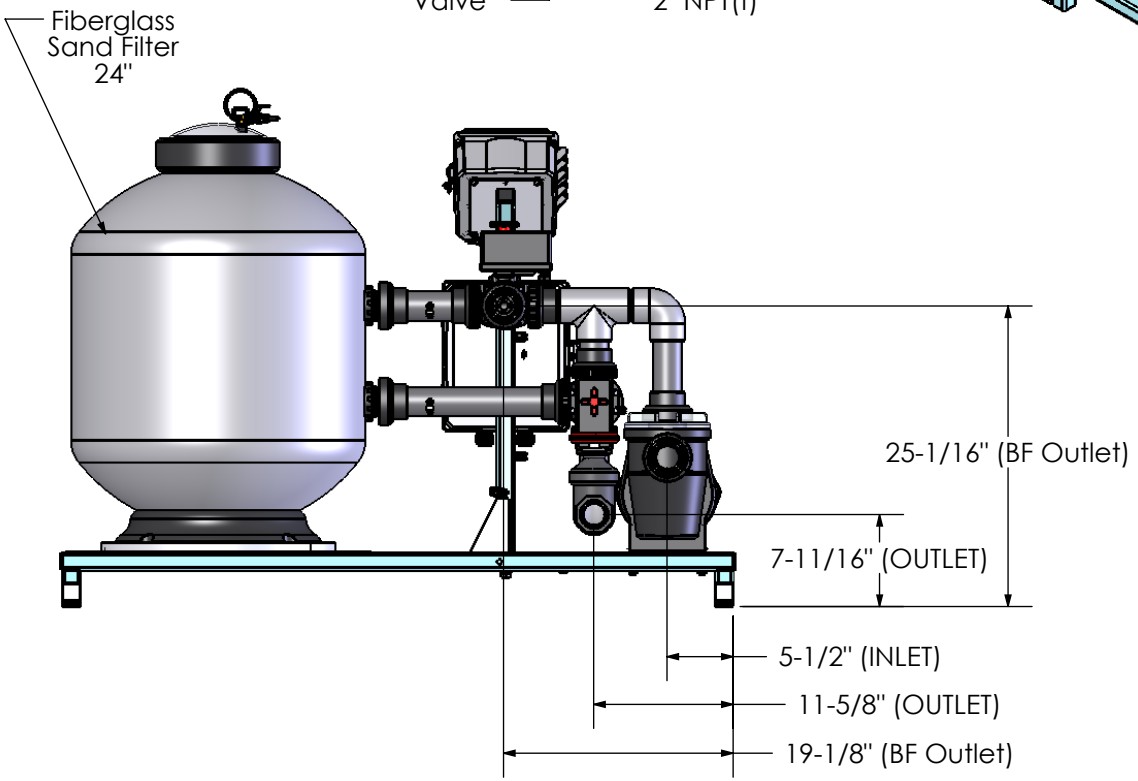
PRODUCT SPECIFICATION

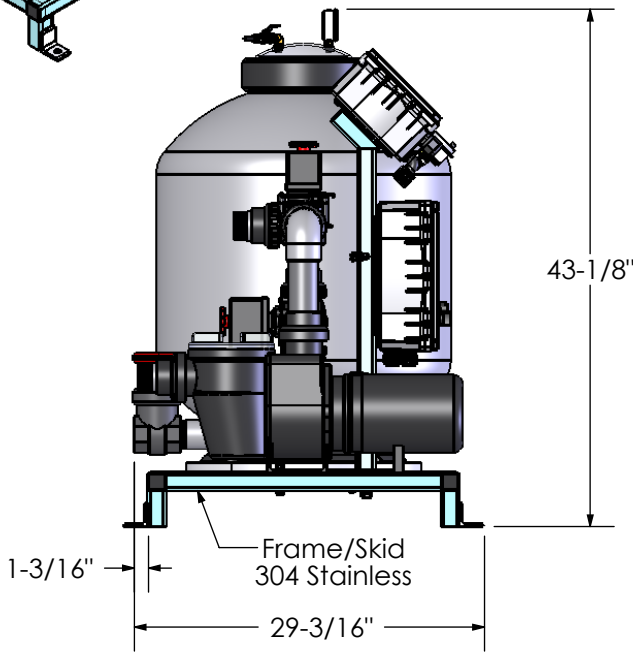
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

DRAWN	J. Larsen	12/10/09	TITLE
CHECKED			TowerGuard TG-20T-3P Automatic Sand Filter Skid System
ENG APPR.			
MKT APPR.			
SHEET 1 OF 1	Ref: ML21332-20T-3P	Rev. A	









PRODUCT SPECIFICATION

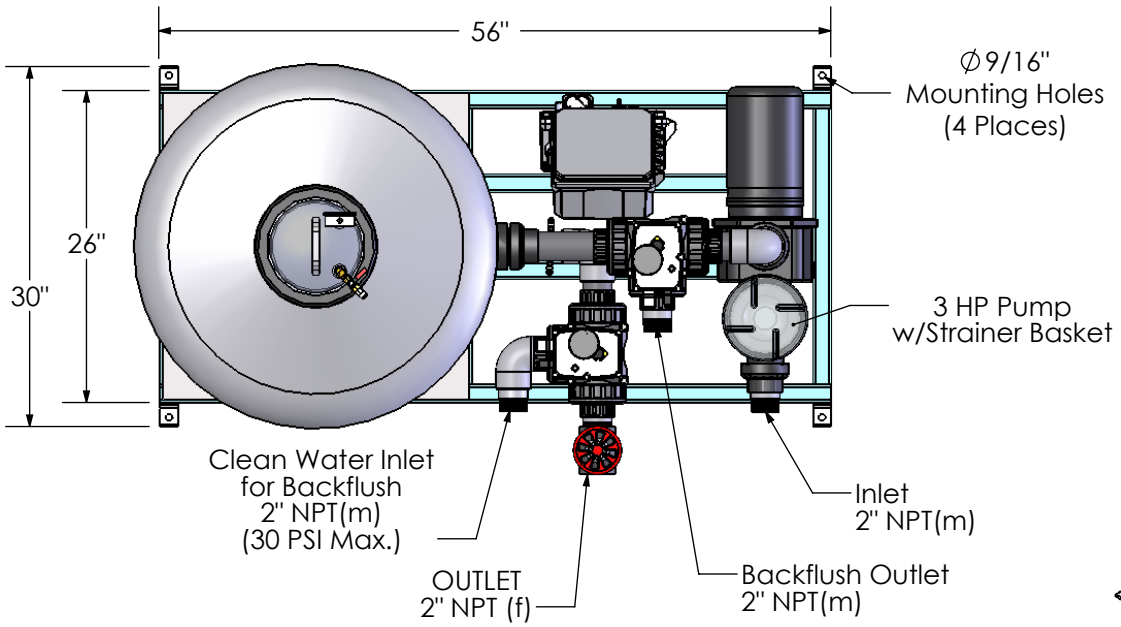
MILLER LEAMAN INC
800 Orange Ave. Daytona Beach FL 32114

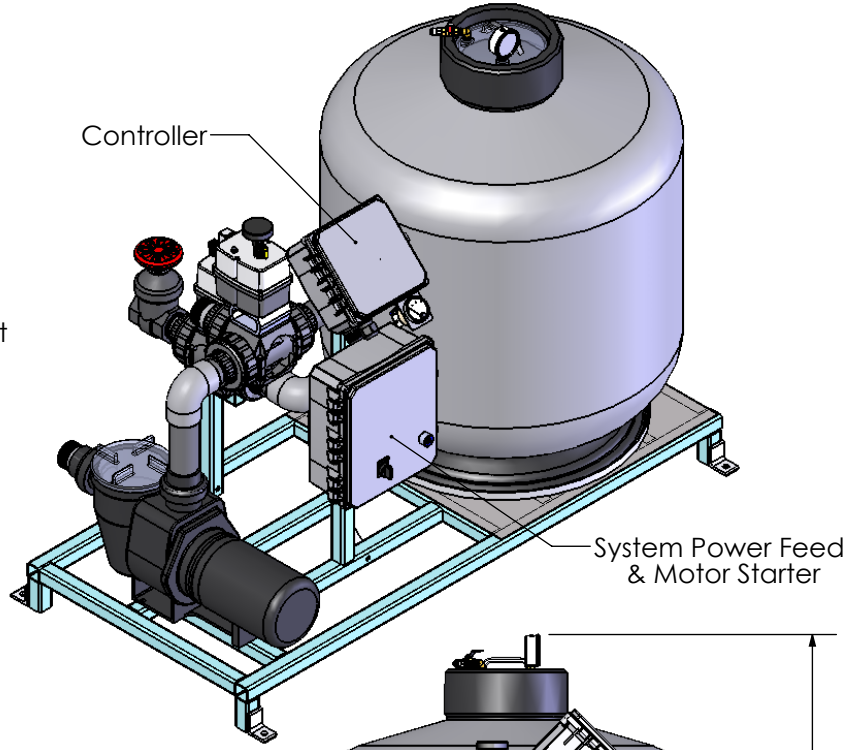
DRAWN	J. Larsen	11/16/11
CHECKED		
ENG APPR.		
MKT APPR.		
SHEET 1 of 1	Ref: ML21332-24T-3P	Rev. --

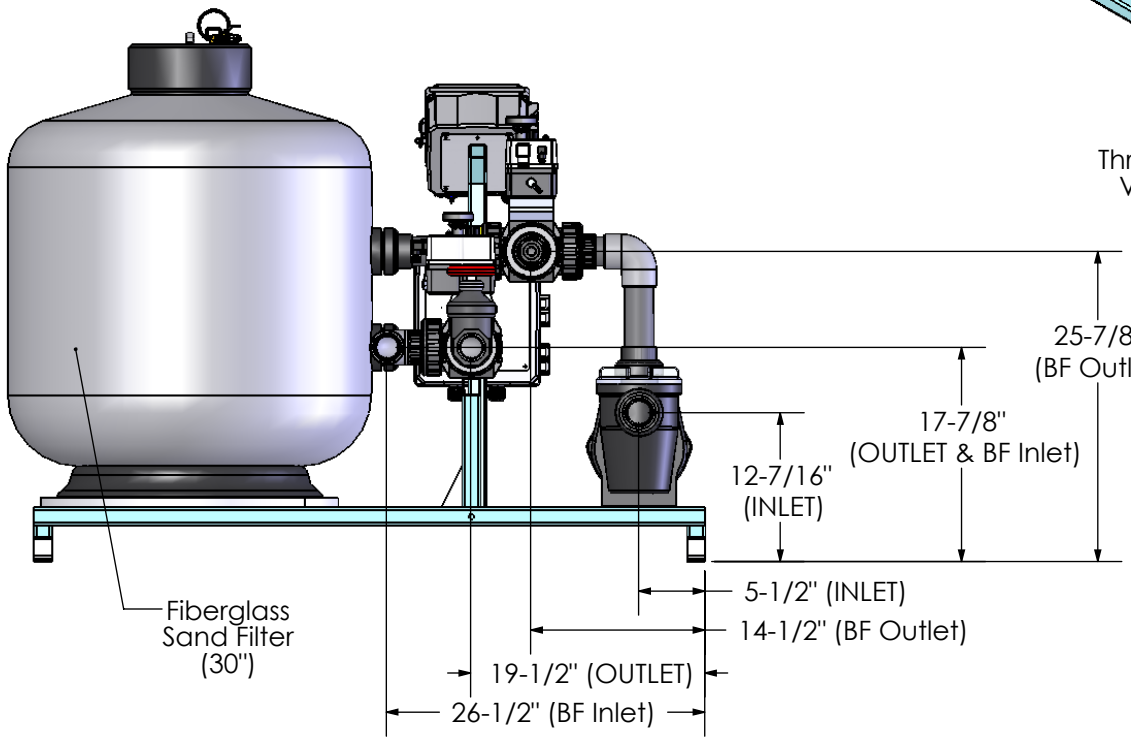
SYSTEM REQUIREMENTS:

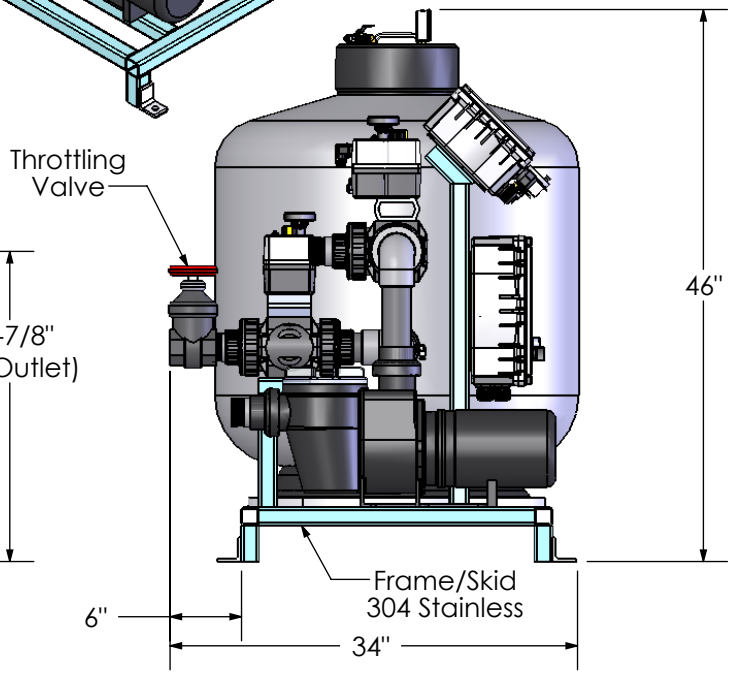
Electrical: 460VAC/3Phase/60Hz/3A
Water Supply Pressure: 10 PSI Max
System Pressure: 50 PSI Max

TITLE:
TowerGuard TG-24T-3P
Automatic Sand Filter
Skid System









SYSTEM REQUIREMENTS

Electrical:
230 VAC, 1 Phase, 60 Hz, 14A
Maximum System Pressure: 50 PSI
Backflush Inlet Pressure: 30 PSI Max.

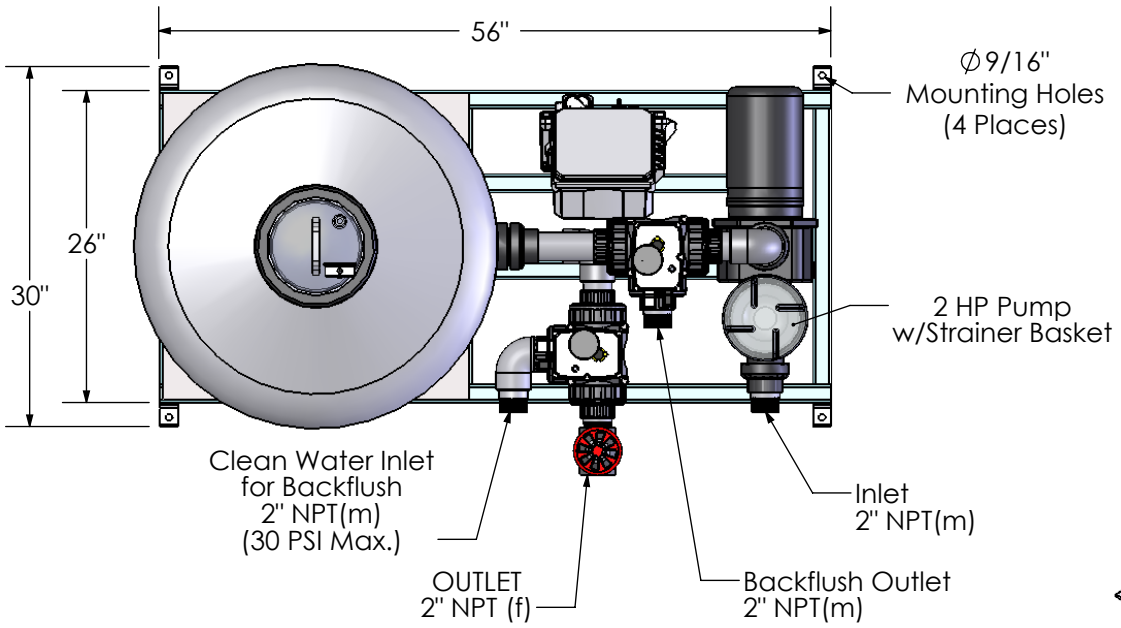
PRODUCT SPECIFICATION

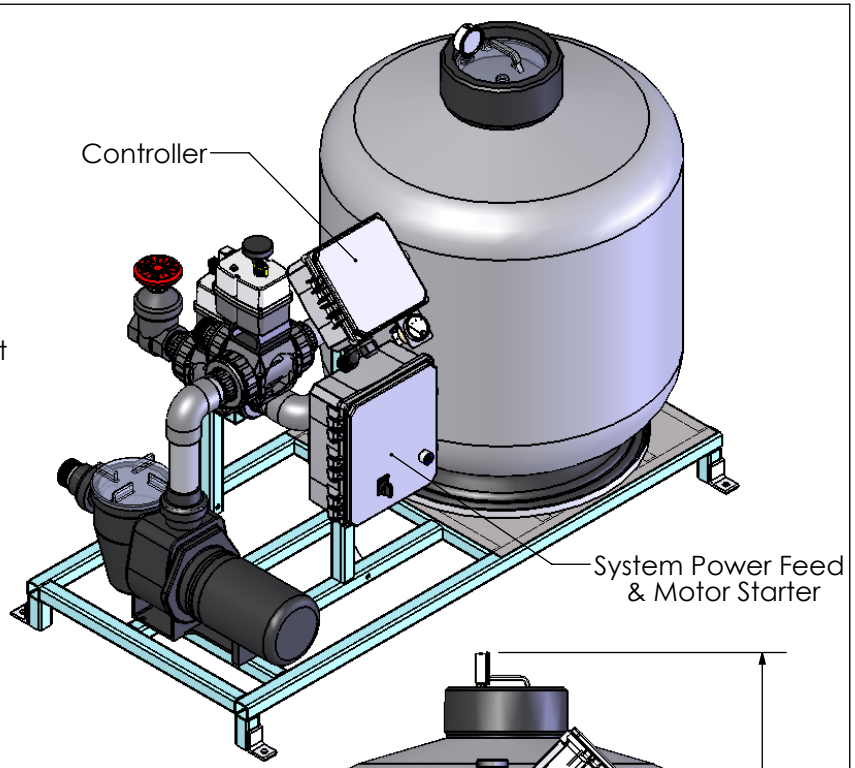
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

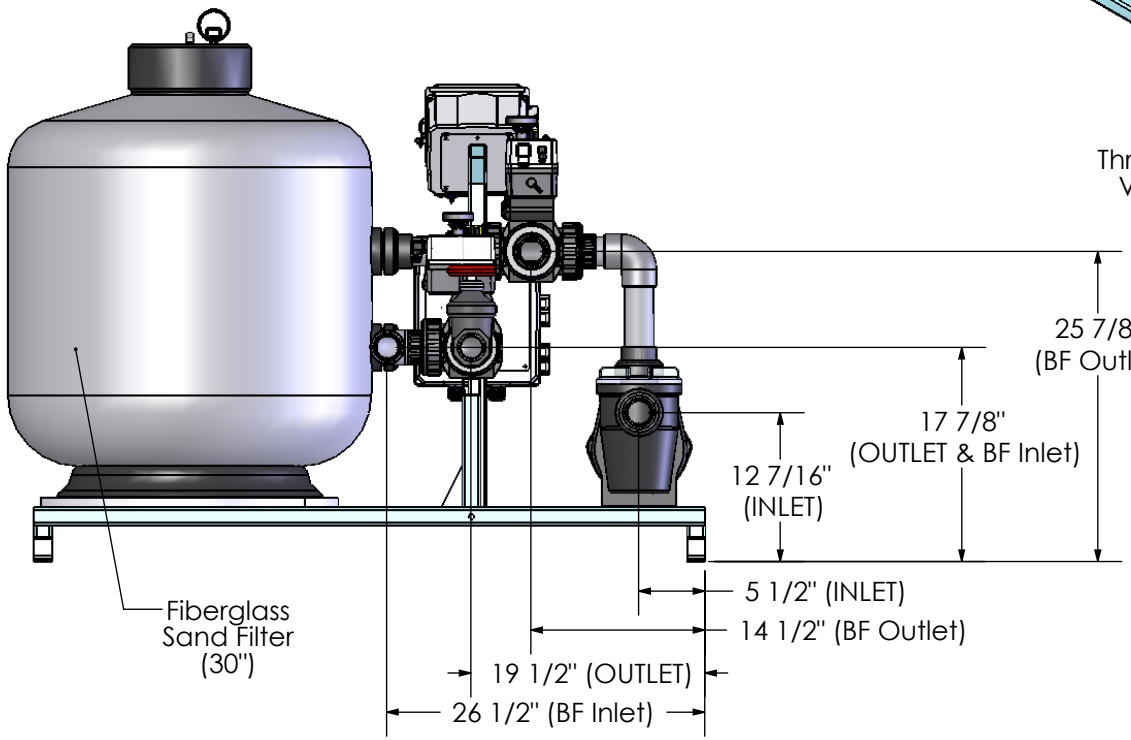
DRAWN	J. Larsen	11/23/10
CHECKED		
ENG APPR.		
MKT APPR.		

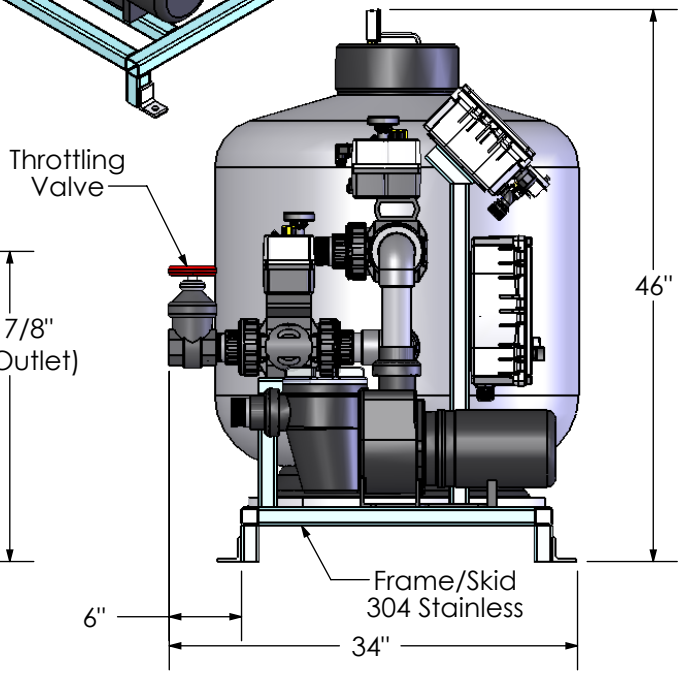
SHEET 1 OF 1

TITLE
TowerGuard TG-30C-1P
Automatic Sand Filter
Skid System









SYSTEM REQUIREMENTS

Electrical:
460 VAC, 3 Phase, 60 Hz, 5A
Maximum System Pressure: 50 PSI
Backflush Inlet Pressure: 30 PSI Max.

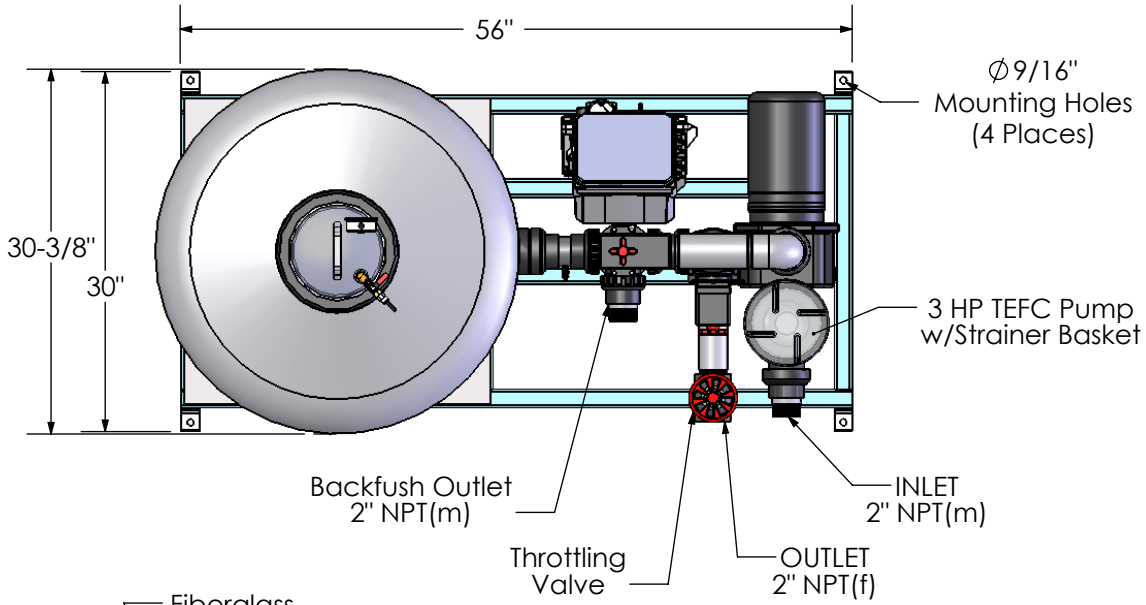
PRODUCT SPECIFICATION

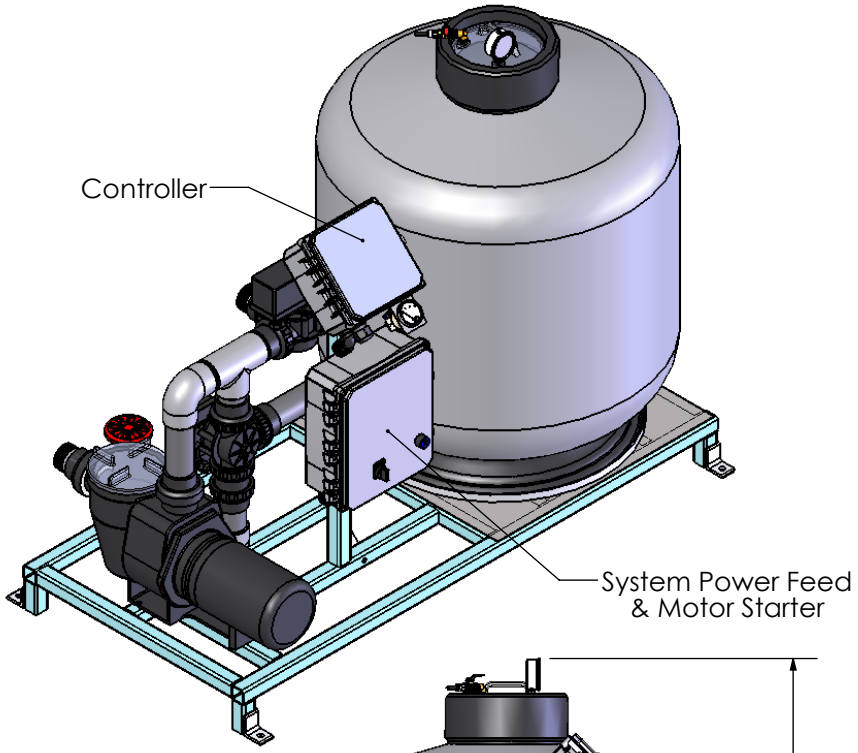
MILLER-LEAMAN INC.
800 Orange Ave. Daytona Beach FL 32114

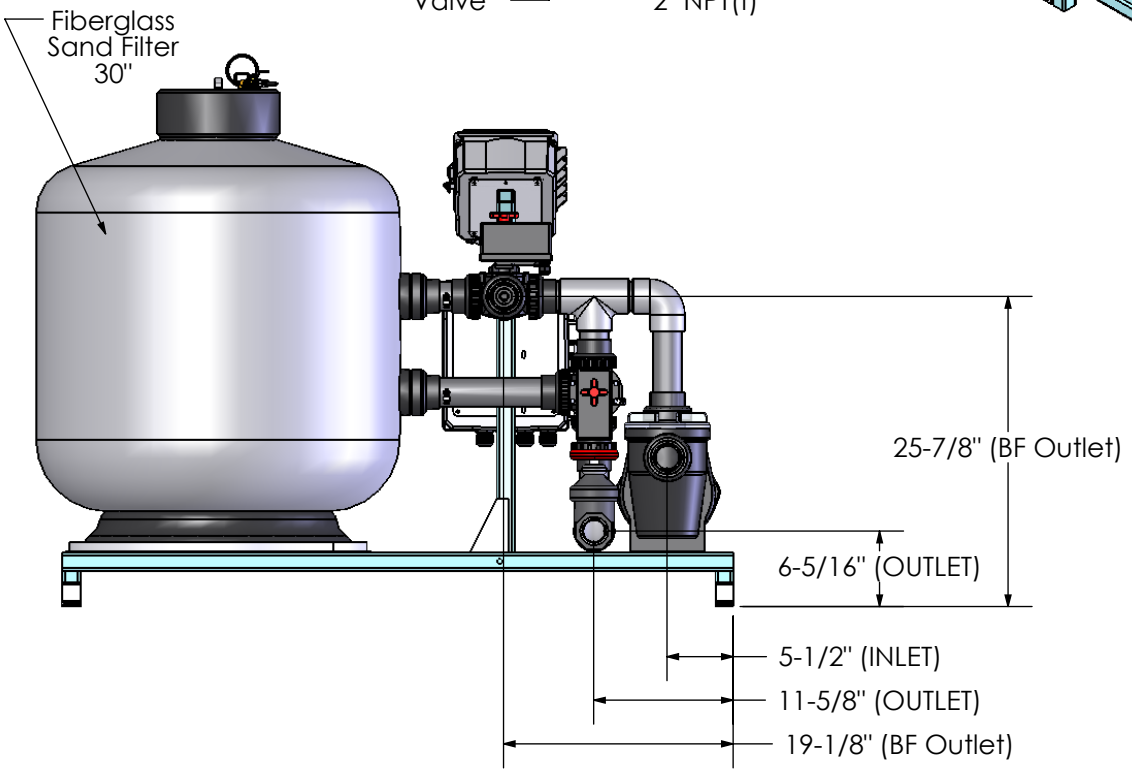
DRAWN	J. Larsen	3/31/10
CHECKED		
ENG APPR.		
MKT APPR.		

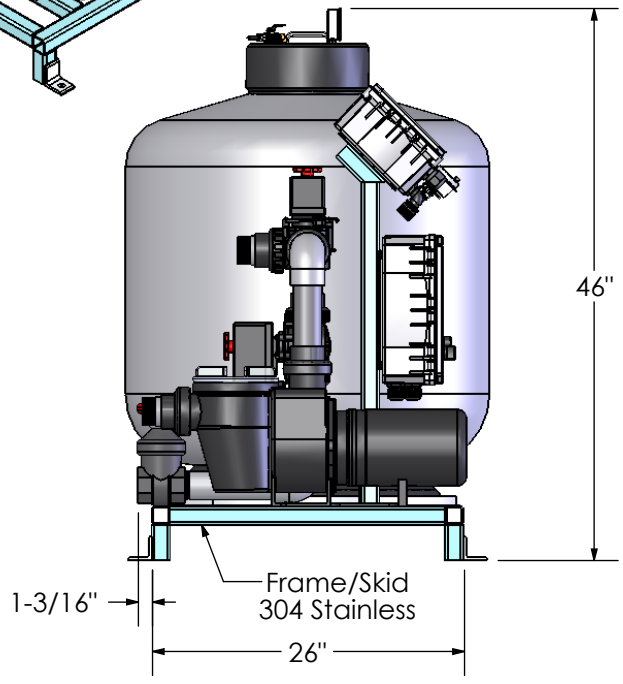
SHEET 1 OF 1

TITLE
TowerGuard TG-30C-3P
Automatic Sand Filter
Skid System









PRODUCT SPECIFICATION	DRAWN	L.Brannan	7/25/11	**SYSTEM REQUIREMENTS:**
MILLER LEAMAN INC	CHECKED			Electrical: 460VAC/3Phase/60Hz/5A
800 Orange Ave. Daytona Beach FL 32114	ENG APPR.			Water Supply Pressure: 10 PSI Max
	MKT APPR.			System Pressure: 50 PSI Max
	SHEET 1 of 1	Ref: ML21332-30T-3P	Rev. A	

TITLE:
TowerGuard TG-30T-3P
Automatic Sand Filter
Skid System

THOMPSON Strainer

HELIX

MLI turboDISC

TOWER GUARD SAND MEDIA FILTER

MAXIM
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800 Orange Avenue • Daytona Beach, FL 32114
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