

May 10, 2021

Mr. Brian W. Cox, PE  
Plumbing and Water Quality Program Manager  
Division of Environmental Health  
Illinois Department of Public Health  
525 West Jefferson St.  
Springfield, IL 62761

Via email to: [DPH.Plumbing@Illinois.gov](mailto:DPH.Plumbing@Illinois.gov)

Re: UIUC Illini Hall  
Rainwater Reuse System for Fixture Flushing

Dear Mr. Cox,

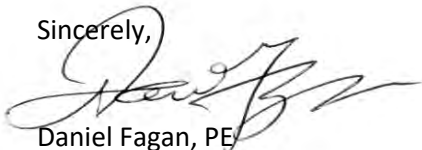
We had spoken to you back in February regarding a project we are designing for the University of Illinois Urbana/Champaign in which the University would like to incorporate a rainwater reuse system for flushing of toilet fixtures. The project is a new 6-story classroom and office building for the University of Illinois. During that discussion, you had conveyed to Emily Koussa, our plumbing designer on the project, the submittal process and material needed to gain approval of such a system

We have been progressing through the design since February and have recently submitted 75% complete documents for review by the University, as well as the Illinois Capital Development Board (it is CDB project). At this stage we have sufficient detail completed in our design to provide the information identified in your February 10, 2021 to Emily Koussa.

To that end we have attached a submittal package that describes the proposed system and equipment, identifies the building layout and location, provides load information and parameters utilized to develop same, and provides a general understanding of the system functionality. This is meant as a preliminary submittal to solicit your opinion on our approach and to determine what modifications to our proposed system design or additional detail is needed to gain approval.

We appreciate any feedback you might be able to provide and are happy to meet at your convenience to discuss our proposed system in more detail. Thank you in advance for your consideration.

Sincerely,



Daniel Fagan, PE

Cc: [Brian.Cox@illinois.gov](mailto:Brian.Cox@illinois.gov)

# UNIVERSITY OF ILLINOIS ILLINI HALL

## RAINWATER HARVESTING SYSTEM

May 10, 2021

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# BASIS OF DESIGN

## SYNOPSIS

Illini Hall is a new building for the University of Illinois that will house the Math and Statistics Departments offices as well as classrooms and amenities spaces serving the building residents and students. The project consists of the demolition of the existing Illini Hall structure on the University of Illinois, Urbana-Champaign Campus and the construction of a new building within its footprint.

The existing Illini Hall, constructed in 1907 is located at 725 S. Wright Street, Urbana, IL.

The new building is planned to be 6-story structure, with approximately 20,000 sf per floor, plus a mechanical penthouse of approximately 6,700 sf, and a partial basement of approximately 8,000 sf. Each floor will include core toilet facilities with approximately 47 water closets and 15 urinals centrally located within the building.

Based on the direction of the University Chancellor, UIUC has targeted a goal of LEED Platinum for the building to further the already prestigious record of the University of Illinois in sustainability. While the design of the building incorporates the use of low-flow plumbing fixtures to garner available LEED points, the University has also established a goal of utilizing collected rainwater and ground water to flush toilets and urinals. Rainwater harvesting and reuse has been a goal of the University for years, but this would be the first project on campus to implement it.

The proposed process for rainwater harvesting is to capture water from the building storm sewer at the basement level of the building into (4) storage tanks. The tanks will be sized to supply one week flushing demand. The captured rainwater from the tanks will be pumped through a treatment skid (consisting of filtration, chlorination, and ultraviolet exposure) and then distributed to toilets and urinals. To prevent organic growth, the stored water will be circulated through the filter system and return to the storage tanks periodically.

Cannon Design is submitting the following document package to the Illinois Department of Public health for review and approval of the proposed rainwater and ground water collection, treatment, and supply as non-potable water for flushing to toilets and urinals in accordance with the Title 77 Ill. Administrative Code Section 890.1940.

**RAINWATER REUSE CONSTRUCTION DESIGN NARRATIVE**

University of Illinois at Urbana-Champaign Illini Hall

**CODES & STANDARDS**

**1. CODES**

- a. International Building Code 2015
- b. Authority Having Jurisdiction
- c. Applicable Local Codes and Ordinances
- d. Illinois Plumbing Code, 2014

Abbreviation

AHJ

**2. STANDARDS**

- a. American Society of Mechanical Engineers
- b. American Society for Testing and Materials
- c. American Society of Plumbing Engineers
- d. American Society of Sanitary Engineering
- e. American Water Works Association
- f. Underwriters Laboratories Inc.
- g. NSF International
- h. American National Standards Institute
- i. Occupational Safety and Health Administration

ASME  
ASTM  
ASPE  
ASSE  
AWWA  
UL  
NSF  
ANSI  
OSHA

**SYSTEMS DESCRIPTION**

**1. Utilities**

- a. Potable Water service:
  - 1) Provide new 8” combined water service entering basement on southeast corner of building.
  - 2) Combined 8” water service splits to 2” domestic water (25 WSFU) and 6” fire water services.
  - 3) Provide water meter on domestic water service to supply building.
  - 4) Distribute potable water in copper pipe clearly labeled.
- b. Non-Potable Water System (Rain and Ground Water Harvesting):
  - 1) A 4” non-potable water (545 WSFU) service is supplied by a rain and ground water harvesting system. Domestic water makeup is provided for start-up and maintenance purposes and for use in the event of extreme drought.
  - 2) Provide 500 gpm vortex pre-filter on storm drain line upstream of the above ground cisterns.
  - 3) Provide (4) 8’ tall, 8’ diameter above ground cisterns with level sensors and control valves for isolating storm sewer from tanks when tanks are full.
  - 4) Provide 5 HP duplex non-potable water booster pump after the storage tanks and prior to the treatment system.
  - 5) Provide potable water make to the tanks with a solenoid valve and air gap fitting, also controlled by tank level sensors.
  - 6) Provide Rainwater Management Systems RMS-RWF-25 prepackaged rainwater control station with integrated filtration and water treatment or equivalent rated for 25 gpm flow rate.
  - 7) Provide flow meters on the non-potable water pumped from the tanks and on the potable make-up water supply line.
- c. Route 4” non-potable water supply piping to below stacked bathrooms and up through toilet chases to serve urinals and water closets only. Non-potable water will be distributed in purple CPVC pipe and clearly labeled.
- d. Non-potable water storage tank fill will come from a 10” building storm service (23,000 SF, 837 gpm peak flow) exiting at the west side of the building. In addition to rainwater, the storm sewer will collect

water from a drain tile system around foundation perimeter and below floor. At the connection from the building storm sewer to the storage tanks, a vortex filter will be provided to separate out the first flush of water from the roofs.

## **2. Stacked Bathrooms**

- a. Route non-potable water supply vertically through toilet chases and distribute within the chase to serve water closets and urinals for flushing.

## **3. Roof Areas**

- a. Provide fully piped primary and overflow storm drainage systems.
- b. Route storm drainage piping horizontally from roof drains to vertical stacks at structural columns.
  - 1) Route primary storm system piping to rainwater storage tank in basement.
  - 2) Route overflow from rainwater storage tank to building storm service in basement.
  - 3) Route overflow storm drainage system piping to downspout nozzles 12" above grade on building exterior.

## **DESIGN CRITERIA**

### **1. Storm Water Drainage**

- a. Horizontal storm water piping above ground will be insulated with glass fiber pipe insulation with vapor barrier to prevent condensation.
- b. Storm piping will incorporate the storm occurrence, duration, rainfall rate and roof catchment areas for sizing:
  - 1) Rainfall rate = 100-year occurrence, 60-minute duration, 3 inches per hour.
  - 2) Roof catchment area = 22,750 sf.
- c. Storm pipe will be routed by gravity to maintain a positive slope with a minimum velocity of two feet per second. Storm system will be routed by gravity to storage tanks.
- d. Overflow storm piping will be designed for 100 percent redundancy.
- e. A foundation drainage system will be provided around the perimeter and below the basement floor of the building and will be routed to the duplex storm water pumping system. The pumped drainage will connect to the exiting storm sewer upstream of the rainwater storage tanks.

### **2. Rainwater Harvesting/Non-potable Water**

- a. Non-potable water will supply flushing water closet and urinal fixtures only.
- b. Non-potable water will be generated from collected storm water from the building roof drains and pumped ground water and only supplemented by a potable domestic water makeup connection to meet minimum daily flush water demands in the event of system maintenance or extreme drought.
- c. Non-potable water storage tanks will collect storm/sub-soil drainage at any time they are not full. Once full, level sensing isolation valves will close off further stormwater to the non-potable water storage tanks and storm water will flow by gravity to the site sewer. Site sewer will be sized to accommodate the total building storm water drainage load and drain by gravity to new site storm sewer system.
- d. Collected non-potable water will be treated to meet ICC B805 requirements and meet a 25 gpm flow rate.
- e. Non-potable water piping will be sized per pipe velocity, water fixture units (WSFU) connected, and the minimum flow pressure required at each fixture or piece of equipment.
  - a. WSFU for toilets and urinals = 545
  - b. Pipe Velocity = 6 feet per second maximum.

- c. Maximum allowable pressure loss = 3 psi/100 ft
- f. Non-potable water storage tanks will be sized utilizing the anticipated flushing water used in the building and the available storage tank dimensions and volumes relative to available storage space.
  - a. Monthly Demand = 13,177 gallons
  - b. Storage availability = 2,103 gallons per tank; 8,412 gallons total with 4 tanks.
  - c. Days of storage = 13 days (estimated without replenishment).
- g. Valves will be provided to isolate individual toilet and urinal fixtures within one room or a battery of toilet and urinal fixtures within one room.

## **EQUIPMENT & MATERIALS**

### **1. Valves:**

- a. CPVC Union Ball Valves: MSS SP-122, with full-port ball, socket detachable end connectors, and pressure rating not less than 125 psig (860 kPa) at 73 deg F (23 deg C).
- b. CPVC Butterfly Valves: With lever handle and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).
- c. CPVC Check Valves: Horizontal Swing design and pressure rating not less than 150 psig (1035 kPa) at 73 deg F (23 deg C).

### **2. Flanges:**

- a. Flanges will be companion type, faced and drilled for not less than 125# steam working pressure complete with necessary adapter, and will be of size and material of adjacent piping.

### **3. Unions:**

- a. Unions on copper piping will be bronze minimum working pressure of 200 psi.
- b. Unions on steel and iron will be ferrous ground joint brass to iron, rated for the working pressure of the system.

### **4. Water Distribution Piping:**

- a. All water distribution piping will be new, clean and installed in accordance with the Plumbing Code. System piping will be flushed clean, pressure tested and disinfected prior to service.
- b. Water distribution piping will be provided to each floor with a maximum of 80 psi per floor. At locations where water pressure exceed 80 psi, pressure reducing valve stations will be implemented.
- c. Aboveground Domestic Potable Water Systems:
  - 1) Tubing to be Type L hard temper with wrought copper fittings conforming to ASTM B88 and ASME B16.22. All joints will be soldered with ASME AWS/A5.8 lead free solder.
  - 2) Copper tubing with grooved ends and mechanical joints are acceptable for sizes 2-1/2" to 6" only. Tubing to be Type L hard temper with wrought grooved end fittings conforming to ASTM B88 and ASTM B75.
- d. Non-Potable Water Systems:
  - 1) Purple Schedule 80 CPVC Pipe meeting ASTM F 441/F441M.
  - 2) Purple CPVC Schedule 80 Fittings meeting ASTM F438, socket type.

## 5. Storm Drainage Piping:

- a. All storm drainage will be new and clean. System piping will be flushed clean and pressure tested.
- b. Aboveground Rainwater Drainage Piping:
  - 1) Schedule 40 PVC with solvent cement joints. Joints will conform to ASTM D 2665, socket type, made to ASTM D 3311, drain, waste and vent patterns. PVC solvent cement will conform to ASTM D2564 and have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Adhesive primer will conform to ASTM F656 and have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- c. Below Ground Rainwater Drainage Piping:
  - 1) Schedule 40 PVC with solvent cement joints. Joints will conform to ASTM D 2665, socket type, made to ASTM D 3311, drain, waste and vent patterns. PVC solvent cement will conform to ASTM D2564 and have a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24). Adhesive primer will conform to ASTM F656 and have a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

## 6. Plumbing Specialties:

- a. General:
  - 1) Fittings, devices and drainage specialties as required for proper maintenance of all plumbing systems will be provided.
- b. Roof Drains:
  - 1) Dura-coated cast iron body with membrane flashing clamp and low silhouette aluminum dome, supplied with underdeck clamp and vandal-proof secured top.
- c. Water Meters:
  - 1) Meters will be magnetic flow type with stainless steel casing and trim. Meter will consist of standard trimmings including an all-bronze bypass meter with isolation valves, bronze and stainless steel gears and spindles, strainer and flanged ends. Meter will be fitted with OS&Y gate valves, cast iron body and bronze trim. Meter will meet all requirements of the local Water Department.

## 7. Non-potable System Specialties & Equipment:

- a. Non-potable Storage Tanks & Accessories
  - 1) Storage Tanks: 8' diameter by 8' high black or dark green plastic tanks with a maximum 2,550 gallon capacity and manway access for tank maintenance.
  - 2) Level Indicator: Wireless storage tank level sensor.
  - 3) Float Switch: Polyethylene switch level and float housing with flexible cable; dry run protection, normally open.
  - 4) Second Source Storage Tank Float Switch: Polyethylene switch level and float housing with flexible cable; control normally closed solenoid valve.
  - 5) Control Panel:
    - a) Housed in NEMA 4 hinged wall mount enclosure with back plate, fully integrated into rainwater harvesting system, prefabricated and configured to run pumps as required.
    - b) Provide one normally open float switch to protect pump from run dry condition.



- c) Provide one normally closed float switch to activate normally closed solenoid valve to activate make-up water source.
  - b. Non-potable Water Repressurization (Booster) Pump
    - 1) 5 HP duplex non-potable water booster pump to supply building water closets and urinals.
    - 2) Expansion tank sized per booster system demand, pressure and tank location.
    - 3) Design Conditions:
      - a) Total Boost Provided =113 PSI
      - b) Flow = 25 GPM
  - c. Treatment Skid
    - 1) 25 gpm treatment/purification system contained within a skid footprint consisting of the following:
      - a) 50-micron backwash filter
      - b) 5-micron bag filter with stainless steel housing
      - c) Carbon filter with stainless steel housing
      - d) UV light
      - e) Chlorine disinfection
      - f) Touchscreen system controller
  - d. Vortex Filter
    - 2) Polypropylene filter housing with stainless steel fine mesh filter and lift handle.
    - 3) Vertical orientation with self-cleaning design installed prior to tank collection.
    - 4) 500 gpm flow capability.

# CALCULATIONS

WATER DEMAND (WSFU METHOD)  
RAINWATER SUPPLY AND COLLECTION  
BOOSTER PUMP

# CANNONDESIGN

PROJECT: Illni Hall  
 PROJECT NO: 5895.01  
 LOCATION: Champaign, IL

DATE: 05/10/21  
 DESIGN PHASE: CD  
 BY: EK

## **DOMESTIC BOOSTER PUMP CALCULATION**

Fill in each line item. Do not enter any values in the yellow hi-lighted spots.

### **Pump Differential Pressure Required**

1.	<u>Pressure required at top fixture:</u>	<u>40</u>	PSIG
	Flush Valve: 40 PSI		
	Flush Tank: 25 PSI		
2.	<u>Static Head - Building Elevation:</u>		
	Floors _____		
	Feet _____		
	Misc. floor height <u>121</u>		
	Total Feet <u>121</u>		
	Total Static Head <u>52</u>		PSI
	(Total Head (Ft) x 0.433 PSI/FT)		
3.	<u>Pipe Friction Loss</u>		
	<u>15%</u> of Static Head	<u>8</u>	PSI
4.	<u>System Pressure Required</u>	<u>100</u>	PSI
	(Total 1,2,3)		
5.	<u>Minimum Suction Pressure at Booster System</u>		
	7a.) City Water Pressure	<u>0</u>	PSI
	7b.) Meter	<u>0</u>	PSI
	Backflow devices	<u>0</u>	PSI
	Filter Skid	<u>10</u>	PSI
	7b.)	<u>10</u>	PSI
	7c.) Suction Total	<u>-10</u>	PSI
	(7a.-7b.)		
6.	<u>Differential Pressure :</u>	<u>110.25</u>	PSI
7.	<u>Internal Booster System Loss</u>	<u>5</u>	PSI
	(Typical 5-7 PSI)		
<b>8</b>	<b><u>Pump Differential Boost required</u></b>	<b><u>115.25</u></b>	<b>PSI</b>
<b>9</b>	<b><u>Pump total Dynamic head</u></b>	<b><u>266.23</u></b>	<b>FEET</b>

Notes:

**Illinois Plumbing Code Fixture Unit Values (Title 77, Part 890)**

(Sect 890, App A: Tables E, F, M)

Project: UIUC Illini  
 Job Number: 5895.01  
 Updated date: 3/25/2021  
 Designer: ESK

	DFU	DFU	QUAN-	MARK	TYPE OF FIXTURE	SFU EACH			SFU SUBTOTAL			COMMENTS
	SUBTOTAL	EACH	TITY			H	C	T	H	C	T	
	45	3	15		URINAL, SYPHON JET	0	5	5	0	75	75	
	376	8	47		WC-FV (PUB)	0	10	10	0	470	470	
<b>TOTALS</b>	<b>421</b>		<b>62</b>						<b>0</b>	<b>545</b>	<b>545</b>	
	0				FUTURE				0	0	0	
<b>TOTAL FUTURE</b>	<b>421</b>								<b>0</b>	<b>545</b>	<b>545</b>	<b>GPM 0/155/155</b>

<b>Monthly Average Precipitation and Supply</b>			
<b>Month</b>	<b>Total Precip (inches)</b>	<b>Total Precip (feet)</b>	<b>Total Monthly Supply (gallons)</b>
January	2.73	0.23	22,634
February	2.56	0.21	21,223
March	3.66	0.31	30,400
April	5.18	0.43	43,011
May	4.86	0.41	40,356
June	5.00	0.42	41,501
July	3.34	0.28	27,712
August	2.73	0.23	22,651
September	3.43	0.29	28,458
October	3.53	0.29	29,305
November	3.02	0.25	25,023
December	2.02	0.17	16,793
<b>Annual Total</b>	<b>42.07</b>		
<b>Monthly Avg</b>	<b>3.51</b>	<b>0.29</b>	<b>29,089</b>

<b>Monthly High (gallons)</b>	<b>43,011</b>
<b>Monthly Low (gallons)</b>	<b>16,793</b>

*Average Monthly Precipitation Data from 2016-2020*

### Storage Tank Sizing

Daily demand (659 gallons per day) x Days of storage = Total Gallons of storage per day specified.

Refer to table below for storage relative to demand days:

<b>Demand Days</b>	<b>Gallons of Storage</b>
1	659
2	1,318
3	1,977
4	2,635
5	3,294
6	3,953
7	4,612
8	5,271
9	5,930
10	6,588
11	7,247
12	7,906
13	8,565
14	9,224

# Rainwater Collection Calculation

## UIUC Illini Hall

Champaign, Illinois

### Calculating Building Flushing Demand

(As recommended within the ASPE Plumbing Engineering Design Handbook – Volume 2)

Fixture Type	Consumption (GPF)	Transient Average Daily Uses	Full Time Average Daily Uses	Transient Occupants	Fulltime Occupants	Water Usage (Gallons)
Toilets (Female)	1.28	1	3	953	189	760
Toilets (Male)	1.28	1	1	953	189	571
Urinals (Male)	0.5	1	2	953	189	666
Notes:					<b>Daily Total</b>	<b>1,997</b>
<p>1 - Diversity applied to assume that 1 in 3 transient students/visitors will use the toilet facilities</p> <p>2 - Usage based on 5 business days per week, 4 weeks per month</p>				<b>diversity factor<sup>1</sup></b>	0.33	
				<b>Adjusted Daily Total (gall)</b>	<b>659</b>	
				<b>Usage Days per Month<sup>2</sup> (gall)</b>	<b>20</b>	
				<b>Monthly Total (gall)</b>	<b>13,177</b>	

### Calculating Rainwater Supply

(Per ASPE Plumbing Engineering Design Handbook – Volume 2)



Catchment Area (roof area) = 22,750 sq. ft.

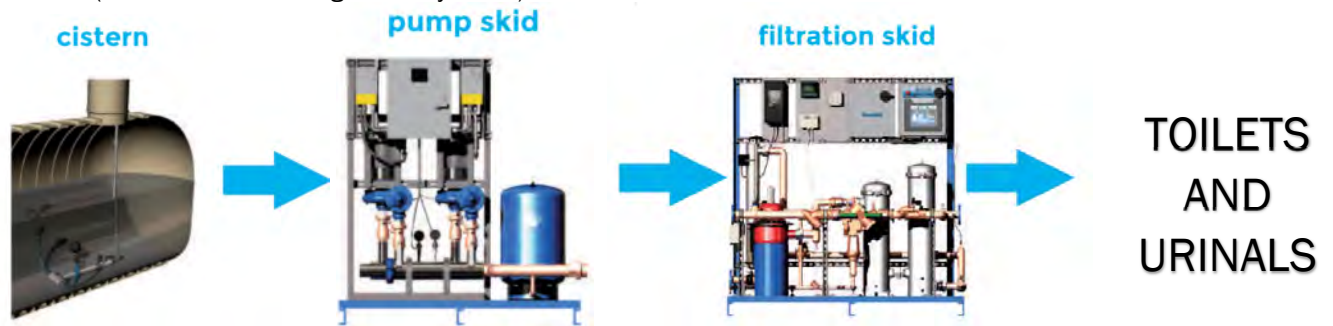
Runoff Coefficient (roof materials) = 0.9

**Storage tank Selection:**

The storage tanks will be located within the basement Mechanical Room of the building which is shared between HVAC, Plumbing and Fire Protection equipment. To allow for future maintenance and/or replacement, the tank is limited in height to that of the lowest duct adjacent to the tank locations, 8'-6" above the finished floor. To avoid conflicts with the ductwork and the egress path, the diameter will be lower than the ductwork elevations.

**System Design**

*General Design*  
Schematic (Per Rainwater Management Systems)



# EQUIPMENT

SPECIFICATION SHEETS



**CODE NUMBER**

3012673

**DESCRIPTION**

0.5 gpf, Polished Chrome Finish, Fixture Connection Top Spud, Single Flush, Battery, Royal® Exposed Sensor Specialty Urinal Reclaimed Water Flushometer.

**DETAILS**

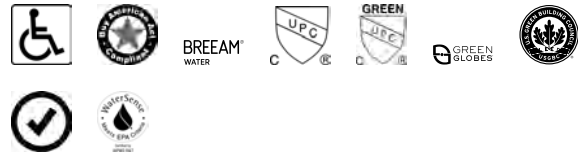
- Flush Volume: 0.5 gpf (1.9 Lpf)
- Finish: Polished Chrome (CP)
- Power Type: Battery
- Battery Life: 3 years
- Valve: Diaphragm
- Valve Body Material: Semi-red Brass
- Fixture Type: Urinal
- Fixture Connection: Top Spud
- Rough-In Dimension: 11 ½" (292mm)
- Spud Coupling: ¾" (19mm)
- Supply Pipe: ¾" (19mm)

**FEATURES**

- True Mechanical Override Flush Button
- Four (4) size C alkaline batteries included
- "Low Battery" Flashing LED
- "User in View" Flashing LED
- 72-Hour Sentinel Flush
- ¾" I.P.S. screwdriver Bak-Chek® angle stop with free spinning, vandal resistant stop cap
- Sweat Solder Adapter w/Cover Tube and Cast Wall Flange with Set Screw
- No External Volume Adjustment to Ensure Water Conservation
- Handle Packing, Main Seat, Stop Seat and Vacuum Breaker Molded from PERMEX® Rubber Compound for Chloramine resistance
- Includes adhesive backed metal wallplate with non-potable water warning
- Features purple wall flange, diaphragm guide, bonnet and inner cover to communicate reclaimed water use
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection



**COMPLIANCES & CERTIFICATIONS**



(ADA Compliant, BAA Compliant, BREEAM Water Credit, cUPC Certified, cUPC Green Certified, Green Globes Water Credit, LEED V4 Water Efficiency Credit, Satisfies LEED Credits, WaterSense Listed)

**RECOMMENDED SPECIFICATION**

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi- Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2.

**ELECTRICAL SPECIFICATIONS**

- Battery Life: 3 years

**VALVE OPERATING PRESSURE (FLOWING)**

15-80 PSI (103-552 kPa). Specific fixtures may require greater minimum flowing pressure - consult manufacturer requirements.

**DOWNLOADS**

- [Royal Reclaimed Water Flushometer Installation Instructions](#)
- [EBV-500/550-A Installation Instructions](#)
- [Control Stop Repair and Maintenance Guide](#)
- [Flush Connections Flanges Repair and Maintenance Guide](#)
- [Tail Piece Repair and Maintenance Guide](#)
- [Reclaimed Water Flushometers Repair and Maintenance Guide](#)
- [Additional Downloads](#)

**NOTES**

All information contained within this document subject to change without notice.

Looking for other variations of the ROYAL 186 RW SFSM product? [View the general spec sheet with all options.](#)

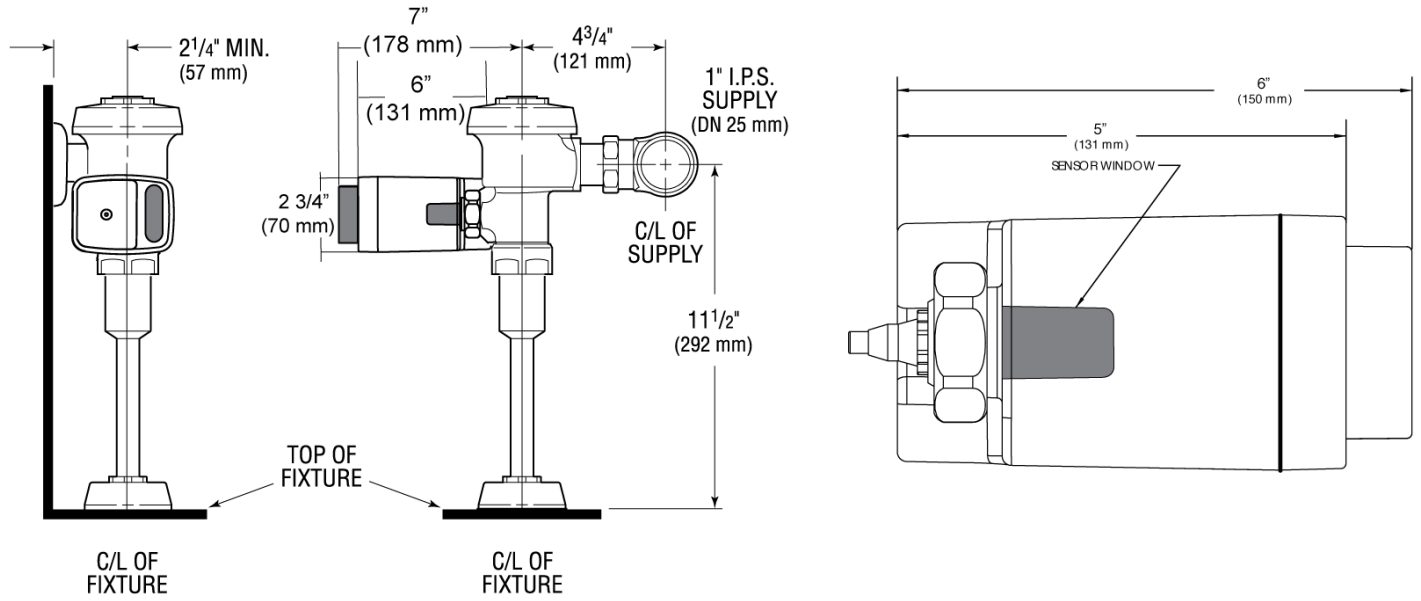
Sloan 10500 Seymour Ave, Franklin Park, IL 60131

Phone: 800.982.5839 • Fax: 800.447.8329 • [sloan.com](http://sloan.com)

Find a compatible [urinal](#) for this flushometer.  
Find a compatible [water closet](#) for this flushometer.

WaterSense compliant when used with a WaterSense compliant fixture

**ROUGH-IN**



**Washbrook® FloWise® Universal Urinal with EverClean®**

- Vitreous china
- **Permanent EverClean® surface inhibits the growth of stain and odor causing bacteria, mold and mildew on the surface**
- Ultra High Efficiency, Low Consumption. Operates in the range of 0.125gpf to 1.0gpf (0.5 Lpf to 3.8 Lpf)
- Flushing rim
- Elongated 14" rim from finished wall
- Washout flush action
- Extended sides for privacy
- 3/4" inlet spud
- Outlet connection threaded 2" inside (NPTF)
- 2 wall hangers
- Fixture only
- Strainer included
- Meets ASME flush requirements at 0.125 to 1.0 gpf

**6590.001EC** Universal Top spud with EverClean

**Nominal Dimensions:**

360 x 480 x 664mm  
 (14-1/8" x 18-7/8" x 26-1/8")

Recommended working pressure – between 20 psi at valve when flushing and 80 psi static

**Compliance Certifications -**

**Meets or Exceeds the Following Specifications:**

- ASME A112.19.2-2008/CSA B45.1-08 for Vitreous China Fixtures



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

**To Be Specified:**

- Color:  White
- Flush Valve:
  - 1.0 gpf Flush Valve: Sensor-Operated:
    - American Standard Selectronic® #6063.101.002 DC Power (Top Spud)
  - 1.0 gpf Flush Valve: Manual-Operated:
    - American Standard # 6045.101.002
  - 0.5 gpf Flush Valve: Sensor-Operated:
    - American Standard Selectronic® #6063.051.002 DC Power (Top Spud)
  - 0.5 gpf Flush Valve: Manual-Operated:
    - American Standard #6045.051.002
  - 0.125 gpf Flush Valve: Sensor-Operated:
    - American Standard Selectronic® #6063.013.002 DC Power (Top Spud)
  - 0.125 gpf Flush Valve: Manual-Operated:
    - American Standard #6045.013.002



MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.

- When installed so top of rim is 432mm (17") MAXIMUM from finished floor.



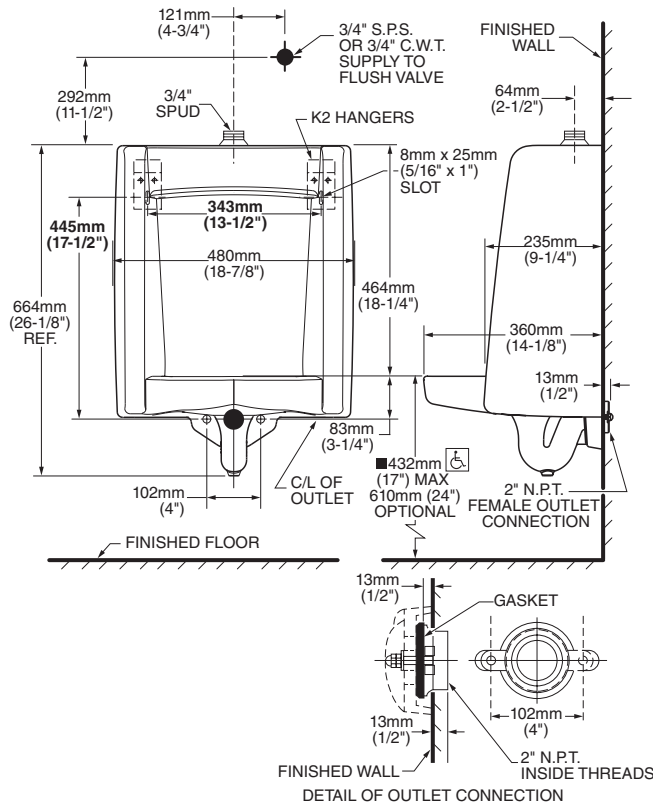
When used with 0.125 gpf urinal flush valve


When used with 0.125 or 0.5 gpf urinal flush valve

ADA COMPLIANT

EVERCLEAN

6590.001EC TOP SPUD



 MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 ACCESSIBLE AND USABLE BUILDINGS AND FACILITIES - CHECK LOCAL CODES.  
 • When installed so top of rim is 432mm (17") MAXIMUM from finished floor.

**NOTES:**  
 FLUSH VALVE NOT INCLUDED AND MUST BE ORDERED SEPARATELY.  
 PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORTS.

**IMPORTANT:** Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2. These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages.

**Afwall® Millennium™ FloWise® Elongated Flushometer Toilet with EverClean®**

- Wall-mounted flushometer valve toilet
- Vitreous china
- High Efficiency, Low Consumption. Operates in the range of 1.1 gpf to 1.6 gpf (4.2 Lpf to 6.0 Lpf)
- Meets definition of HET (High Efficiency Toilet) when used with a high efficiency flush valve (1.1 gpf - 1.6 gpf or 1.28/1.1 gpf dual flush)
- Maximum Performance (MaP) score of 1,000 grams at 1.1 gpf - 1.6 gpf
- Permanent EverClean® antimicrobial surface inhibits the growth of stain- and odor-causing bacteria, mold, and mildew on the surface
- Condensation channel
- Concealed trapway design
- Elongated bowl
- Powerful direct-fed siphon jet action
- 1-1/2" inlet spud
- Fully-glazed 2-1/8" trapway
- 10" x 12" water surface area
- Tested to support static weight load of 1,000 lbs. (454 kg)

- 3351.101** Elongated bowl only, top spud
- 3352.101** Elongated bowl only, top spud with slotted rim for bedpan holding
- 3353.101** Elongated bowl only, back spud
- 3354.101** Elongated bowl only, back spud with slotted rim for bedpan holding

**System MaP\* Score:**

- 1,000 grams of miso @ 1.1 gpf to 1.6 gpf when used with an American Standard flush valve
- \* Maximum Performance (MaP) testing performed by IAPMO R&T Lab. MaP report conducted by Gauley Associates Ltd. and Koeller and Company.

**Component Parts:**

- 047007-0070A** Inlet Spud (furnished with bowl)

**Nominal Dimensions:**

660 x 356 x 381mm  
(26" x 14" x 15")

Recommended working pressure—between 25 psi at valve when flushing and 80 psi static

Fixture only, less seat, bolt caps, and flushometer valve

**Compliance Certifications -**

**Meets or Exceeds the Following Specifications:**

- ASME A112.19.2/CSA B45.1 for Vitreous China Fixtures

\* This product is not recommended for bariatric use.



MEETS THE AMERICANS WITH DISABILITIES ACT GUIDELINES AND ANSI A117.1 REQUIREMENTS FOR ACCESSIBLE AND USABLE BUILDING FACILITIES - CHECK LOCAL CODES.

- When installed so top of seat is 432 to 483mm (17" to 19") from the finished floor.



SEE REVERSE FOR ROUGHING-IN DIMENSIONS

**To Be Specified:**

- Color:  White
- Seat:
  - American Standard #5901.100 Heavy duty open front less cover
  - American Standard #5905.100 Extra heavy duty open front less cover
- Flushometer Valve:
  - 1.6 gpf:
    - Sensor-Operated: American Standard Selectronic® DC Power #6065.161.002 (Top Spud)  
AC Power #6067.161.002 (Top Spud)
    - Manual: American Standard #6047.161.002 (Top Spud)
  - 1.28 gpf:
    - Sensor-Operated: American Standard Selectronic® DC Power #6065.121.002 (Top Spud)  
AC Power #6067.121.002 (Top Spud)
    - Manual: American Standard #6047.121.002 (Top Spud)
  - 1.6 / 1.1 gpf Dual Flush:
    - Sensor-Operated: American Standard Selectronic® DC Power #6065.761.002 (Top Spud)  
AC Power #6067.761.002 (Top Spud)
  - 1.28 / 1.1 gpf Dual Flush:
    - Sensor-Operated: American Standard Selectronic® DC Power #6065.721.002 (Top Spud)  
AC Power #6067.721.002 (Top Spud)



ENVIRONMENTAL  
PRODUCT  
DECLARATION



When used with  
1.1 or 1.28 gpf  
toilet flush valves



ADA  
COMPLIANT

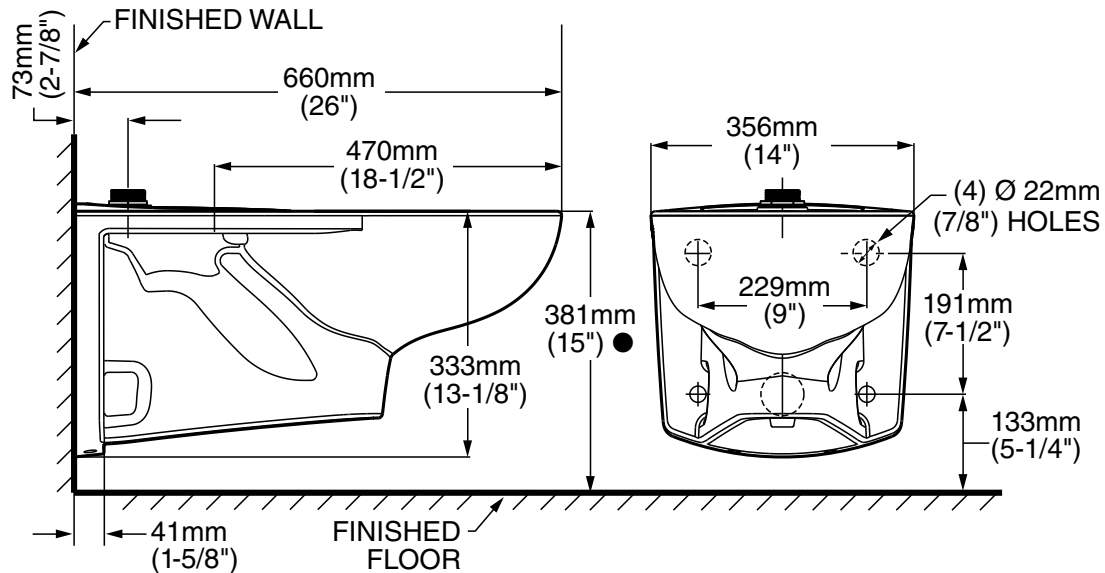


EVERCLEAN

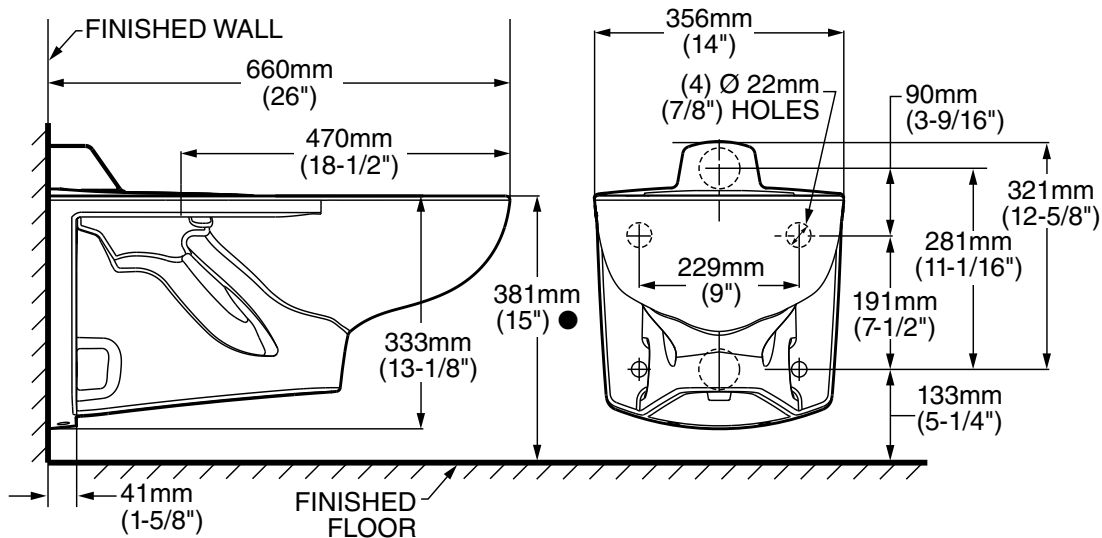


WATER  
EFFICIENT

3351.101/3352.101



3353.101/3354.101



NOTES:

● Toilet designed to meet ADA accessibility standards when top of seat height set at 432 to 483mm (17" to 19") from finished floor.

PRODUCT 3351 AND 3353 SHOWN. 3352 AND 3354 SAME EXCEPT WITH SLOTTED RIM FOR BED PAN HOLDING.

WASTE OUTLET SEAL RING MUST BE NEOPRENE OR GRAPHITE-FELT (WAX RING NOT RECOMMENDED).

SUGGESTED 2mm (1/16) CLEARANCE BETWEEN FACE OF WALL AND BACK OF BOWL.

TO COMPLY WITH AREA CODE GOVERNING THE HEIGHT OF VACUUM BREAKER ON THE FLUSHOMETER VALVE, THE PLUMBER MUST VERIFY DIMENSIONS SHOWN FOR SUPPLY ROUGHING.

FLUSHOMETER VALVE NOT INCLUDED WITH FIXTURE AND MUST BE ORDERED SEPARATELY.

CARRIER FITTING AS REQUIRED TO BE FURNISHED BY OTHERS.

PROVIDE SUITABLE REINFORCEMENT FOR ALL WALL SUPPORT.

**IMPORTANT:** Dimensions of fixtures are nominal and may vary within the range of tolerances established by ANSI Standard A112.19.2.

These measurements are subject to change or cancellation. No responsibility is assumed for use of superseded or voided pages

**CODE NUMBER**

3010081

**DESCRIPTION**

1.28 gpf, Polished Chrome Finish, Fixture Connection Top Spud, Single Flush, Battery, Royal® Exposed Sensor Specialty Water Closet Reclaimed Water Flushometer.

**DETAILS**

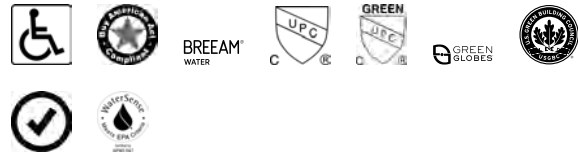
- Flush Volume: 1.28 gpf (4.8 Lpf)
- Finish: Polished Chrome (CP)
- Power Type: Battery
- Battery Life: 3 years
- Valve: Diaphragm
- Valve Body Material: Semi-red Brass
- Fixture Type: Water Closet
- Fixture Connection: Top Spud
- Rough-In Dimension: 11 ½" (292mm)
- Spud Coupling: 1 ½" (38mm)
- Supply Pipe: 1" (25mm)

**FEATURES**

- True Mechanical Override Flush Button
- Four (4) size C alkaline batteries included
- "Low Battery" Flashing LED
- "User in View" Flashing LED
- 72-Hour Sentinel Flush
- Sweat solder adapter with cover tube and cast wall flange with set screw
- No External Volume Adjustment to Ensure Water Conservation
- Includes adhesive backed metal wallplate with non-potable water warning
- Features purple wall flange, diaphragm guide, bonnet and inner cover to communicate reclaimed water use
- Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
- 1" I.P.S. Screwdriver Bak-Chek® Angle Stop with Free Spinning Vandal Resistant Stop Cap
- Diaphragm, Stop Seat and Vacuum Breaker to be molded from PERMEX® rubber compound for Chloramine resistance



**COMPLIANCES & CERTIFICATIONS**



(ADA Compliant, BAA Compliant, BREEAM Water Credit, cUPC Certified, cUPC Green Certified, Green Globes Water Credit, LEED V4 Water Efficiency Credit, Satisfies LEED Credits, WaterSense Listed)

**RECOMMENDED SPECIFICATION**

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi- Red Brass. Valve shall be in compliance with the applicable sections of ASSE 1037 and ANSI/ASME 112.19.2.

**ELECTRICAL SPECIFICATIONS**

- Battery Life: 3 years

**VALVE OPERATING PRESSURE (FLOWING)**

15-80 PSI (103-552 kPa). Specific fixtures may require greater minimum flowing pressure - consult manufacturer requirements.

**DOWNLOADS**

- [Royal Reclaimed Water Flushometer Installation Instructions](#)
- [Control Stop Repair and Maintenance Guide](#)
- [Flush Connections Flanges Repair and Maintenance Guide](#)
- [Tail Piece Repair and Maintenance Guide](#)
- [Additional Downloads](#)

**NOTES**

All information contained within this document subject to change without notice.

Looking for other variations of the ROYAL 111 RW SFSM product? [View the general spec sheet with all options.](#)

[Find a compatible urinal](#) for this flushometer.

[Find a compatible water closet](#) for this flushometer.

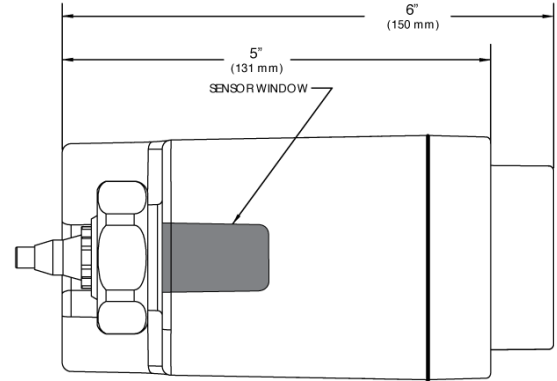
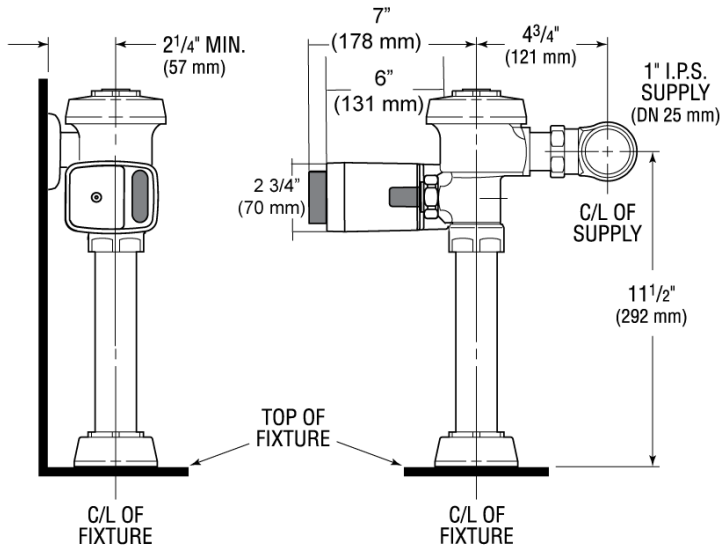
WaterSense compliant when used with a WaterSense

Sloan 10500 Seymour Ave, Franklin Park, IL 60131

Phone: 800.982.5839 • Fax: 800.447.8329 • [sloan.com](http://sloan.com)

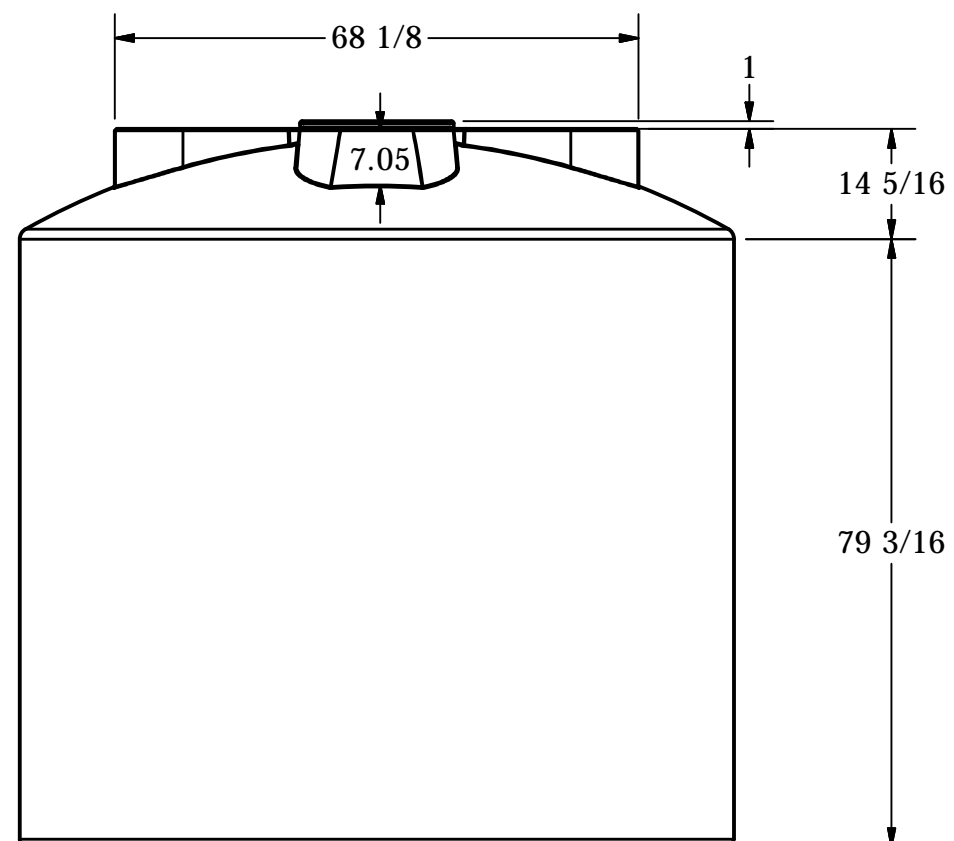
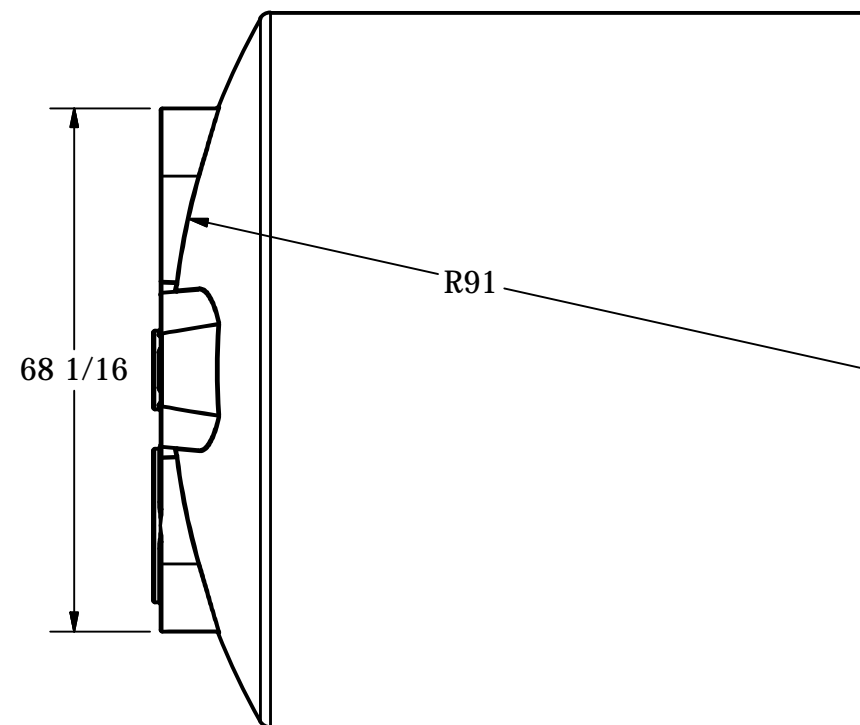
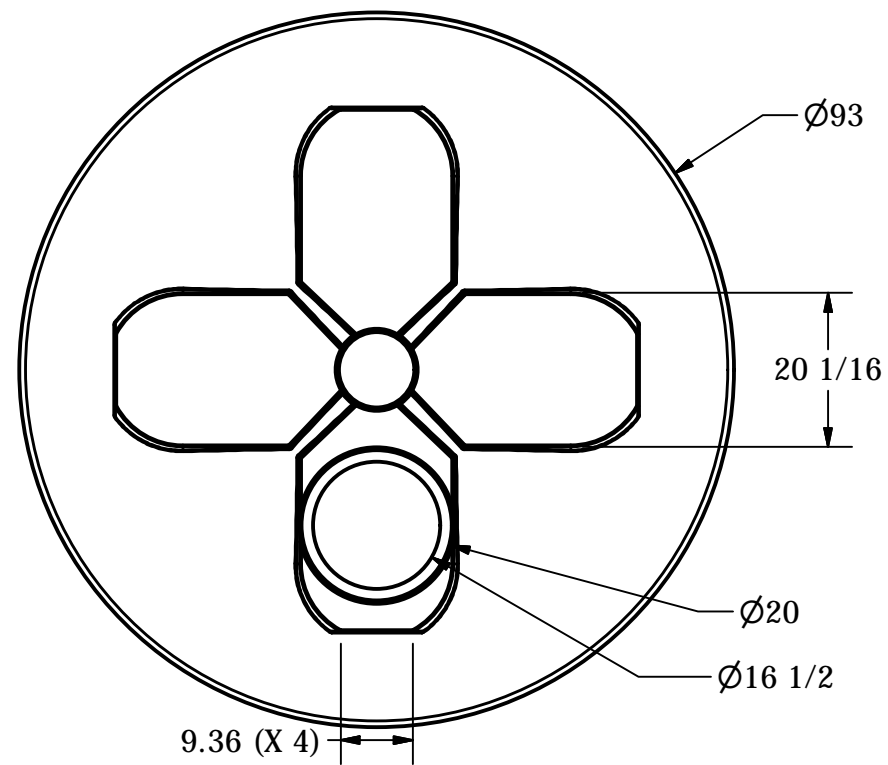
compliant fixture


**ROUGH-IN**



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Phone: 800.982.5839 • Fax: 800.447.8329 • [sloan.com](http://sloan.com)



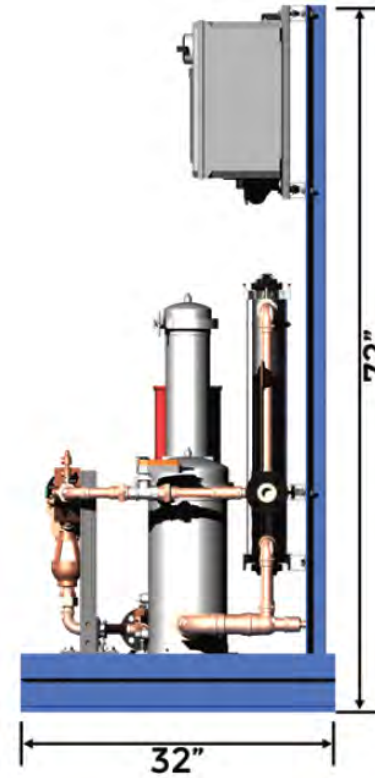
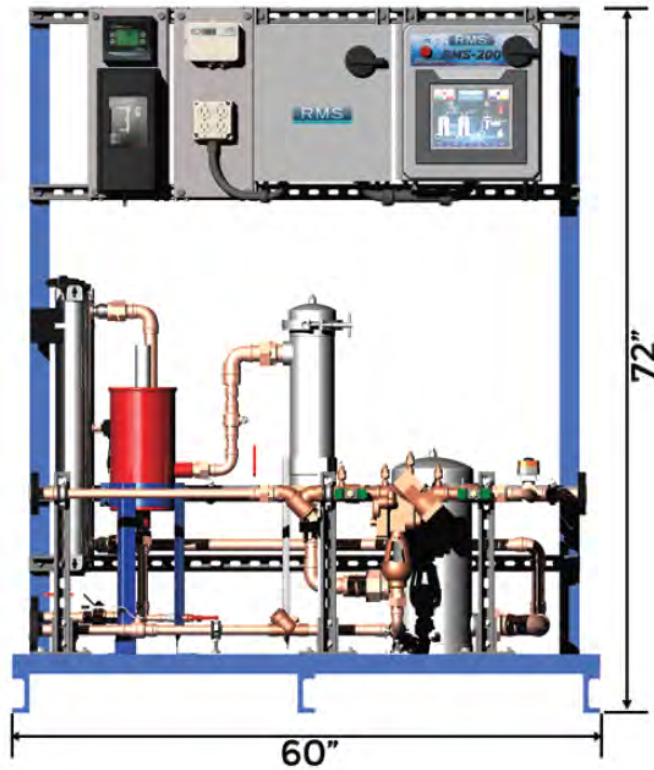


DRAWN Liv Oltean		 <b>NORWESCO</b> NORWESCO, INC. SAINT BONIFACIUS, MN		
CHECKED				
QA		TITLE <b>2550 GALLON VERTICAL TANK, 93"          DIA, CLOVER LEAF W/4 FLATS</b>		
MFG				
APPROVED		SIZE	DWG NO	REV
		<b>B</b>		<b>B</b>
		SCALE: 1/16	SHEET 1 OF 1	

Rainwater Filtration Made-to-Order Skid 25gpm  
at max pressure 125psi with Domestic Backup  
Includes:

- 50 Micron Backwash Filter
- 5 Micron Bag Filter with Stainless Steel Housing
- Carbon Filter with Stainless Steel Housing
- UV Light
- 1" Flange Rainwater Inlet
- 1" Flange Domestic Inlet
- 1" Flange System Outlet
- 1" Flange Drain Line
- 1" Flow Meter
- 1" RPZ
- 1" Domestic Motorized Valve
- RMS 200 Controller - PLC Touchscreen U.L. Listed Control System
- Single Point Power Disconnect Panel
- Pre-Plumbed in Copper Pro Press
- Pre-Wired

Dimensions of 60" L x 32" W x 72" H



RWF-25-50SC-5S-C-UV2-BU  
RMS Standard Filtration Skid

ALL GRADES & ELEVATIONS TO BE SITE  
VERIFIED PRIOR TO CONSTRUCTION

CREATED: 2/2019

REV 0

NOT TO SCALE

DRAWING FOR ILLUSTRATIVE PURPOSES ONLY. NOT FOR CONSTRUCTION.  
DIMENSIONS AND LAYOUT SUBJECT TO CHANGE

RAINWATER MANAGEMENT SOLUTIONS, 1-866-653-8337  
WWW.RAINWATERMANAGEMENT.COM

# Backwash Filter

---

# OPERATION AND MAINTENANCE MANUAL

## IMPORTANT

1. Read these instructions thoroughly prior to proceeding with installation.
2. Ensure that the installation conforms to all applicable local and national codes.
3. These instructions contain important information for the proper maintenance and repair of this equipment. Retain these instructions for future use.

## SAFETY CONSIDERATIONS

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electric shock, or other occurrences, which may injure you or damage your property. The qualified installer or agency must use only factory-authorized kits or accessories when modifying this product.

- Follow all safety codes.
- Wear safety glasses and work gloves.

Be sure all power to equipment is shut off before performing maintenance or service. More than one disconnect may be present.

The power supply (v, ph, and Hz) must correspond to that specified in appropriate literature. The electrical supply provided by the utility must be sufficient to handle load imposed by this unit.

Refer to appropriate sheets for locations of electrical inlets, inlet and outlet piping connections, drain connections and required clearances before setting unit in place.

## CONSTRUCTION

The body of Orival ORV Series Filters are constructed of carbon steel and coated with a baked-on finish both inside and out (stainless steel body available). The body has 1" threaded inlet, outlet and rinse ports (3/4" adapters supplied) for ease of assembly to the supply line, line to process and drain line. All wetted components are constructed of either engineered plastics or non-corrosive metals, allowing for extended service life.

The standard control system consists of an OMNITROL 401 Controller, Differential Pressure Switch (**DPS**) and Solenoid Valve. The **DPS** has dry contacts and is supplied factory preset to 7 psi. The Solenoid Valve supplied is a 3-way normally open valve activated by 24 Vac, and includes an indicator light.

## OPERATING PRINCIPLES

**Normal Flow Pattern - Clean Screen** - The raw water enters the filter inlet from the bottom and passes into the filtration chamber. Water passes through a stainless steel fine screen assembly suspended in the center of this chamber. Filtered water then exits the filter through a port on the filter's side.

The fine screen is fabricated from 316L stainless steel wire mesh in the form of a cylinder and supported by a perforated PVC shell. As the water passes through the screen, solids accumulate, creating a "cake" of dirt on the surface of the screen. This cake performs finer filtration than the screen itself, resulting in increased filter efficiency.

The cake also creates a pressure differential across the screen. The **DPS**, that is pre-mounted and pre-wired to the enclosure of the Controller, monitors this differential pressure via hydraulic tubing, and a rinse cycle is activated once the preset differential pressure is reached.

**Rinse Cycle Flow Pattern** - Once the preset differential pressure is reached, a delay is imposed on the signal from the **DPS** to the Controller. This delay serves to eliminate any false rinse cycles that may be activated due to pressure fluctuations. If the differential pressure persists beyond this delay, the Controller energizes the Solenoid Valve. This activation relieves pressure on the 1" Rinse Valve causing it to open. This pressure relief also relaxes the Piston to allow the Dirt Collector Assembly to move. The Dirt Collector Assembly consists of a closed PVC tube with projecting nozzles on one end and a hydraulic motor on the other end. Opening the 1" Rinse Valve causes the hydraulic motor to rotate the Dirt Collector Assembly, and the Piston allows the Dirt Collector Assembly to move axially exposing the entire screen surface to concentrated spot cleaning action with nozzles that are in close proximity to the screen's surface.

During the rinse cycle, incoming water still passes through the screen. Some filtered water is drawn back through the screen to the dirt collector nozzles, while the remaining filtered water maintains flow to the outlet.

Some applications require a filter equipped with Controlled Outlet Valve (COV) that will shut the outlet flow during rinse cycles to allow the entire incoming flow and pressure to be used for rinsing that results in more effective cleaning cycles. A COV is usually required when the flow is 15 gpm or less and / or when the inlet pressure is below 30 psig.

The rinse cycle duration is 8-10 seconds. See the OMNITROL O&M Manual Supplement for programming instructions.

Upon completion of the rinse cycle, the Solenoid Valve is de-energized. Pressure is restored to the 1" Rinse Valve causing it to close, and the Piston returns the Dirt Collecting Assembly to its normal position. If a COV is installed, it is opened at the end of the rinse cycle.

## INSTALLATION PROCEDURES

**Assembly** - The filter is shipped assembled with OMNITROL 401 Controller, DPS, Solenoid Valve 3-Position Mini-Valve and Pressure Gauge all mounted on the Pressure Gauge Enclosure that is attached to the filter-mounting bracket. All hydraulic tubing lines have been connected. For low pressure or flow applications a COV is also provided. The COV must be assembled to the filter's outlet, and the hydraulic tubing must be rerouted as show on the attached Control Tubing drawing.

**NOTE: Some systems are supplied with different OMNITROL Controllers or with the Controller and DPS detached from the Pressure Gauge Enclosure, to allow for remote mounting separately.**

**Piping Connections** –Typical Filter Installation drawings are part of this manual, and are provided as a guide to a correct installation.

**Unit Positioning** - Orival ORV Series Water Filters should be installed in the upright position, as shown, with the inlet port facing down.

**Guidelines** - For most efficient operation, the following guidelines should be observed:

1. For best results, the filter should be installed as near as possible to the system it is required to protect. However, if low filter inlet pressure is a concern, the filter may need to be installed closer to the pressure source or a COV added.
2. Ensure that the filter inlet pressure will not fall below 25 psig during the rinse cycle with the Solenoid Valve open. Suggested minimum pressure is 30 psig.
3. Ensure that the upstream pipe size from the pressure source to filter is equal to or greater than filter inlet size.
4. An outlet isolation valve must be installed in all applications. An inlet isolation valve is also recommended.
5. Outlet and inlet isolation valves must be installed in situations where the pressure source cannot be shut down during maintenance.
6. Outlet, inlet and bypass valves must be installed in situations where a constant supply of water is required downstream during filter servicing.

**Differential Pressure Switch (DPS) Connections** – Refer to the attached Control Tubing drawing and verify that the control tubing to the pre-mounted DPS have been connected as follows:

1. The high side of the **DPS** must be connected to the inlet port at the filter housing's bottom.
2. The low side of the **DPS** must be connected to the outlet port on the filter housing's side.
3. The **DPS** has been factory preset to a 7 psi differential.

**NEVER ADJUST!!**

## PRESSURE GAUGE & 3-POSITION MINI-VALVE

The supplied 3-Position Mini-Valve with Pressure Gauge and Enclosure is used to assist in troubleshooting and commissioning of the filter. The 3-Position Mini-Valve allows for three independent pressure sources to be individually monitored with the use of a single pressure gauge. The 3-Position Mini-Valve serves as a selector for three ports located on alternating sides of the hex body of the 3-Position Mini-Valve, one for inlet pressure, one for hydraulic motor chamber pressure and one for outlet pressure. A common port is connected to the pressure gauge. The three ports are clearly labeled.

The procedure for reading the three pressures is as follows:

1. To read inlet pressure: Rotate knob until the arrow points to **HIGH PRESSURE**.
2. To read hydraulic motor chamber pressure: Rotate knob until the arrow points to **CHAMBER PRESSURE**.

**Note:** During normal operation, the hydraulic motor chamber pressure should be equal to the inlet pressure. During the rinse cycle, the hydraulic motor chamber pressure should drop to 25-40% of the inlet pressure.

3. To read outlet pressure: Rotate knob until the arrow points to **LOW PRESSURE**.

**Note:** With a clean screen, the outlet pressure should be the same or slightly less than the inlet pressure. As particulates built up on the screen the outlet pressure will decrease. To determine differential pressure across the filter, subtract the outlet pressure from the inlet pressure.

## FIRST COMMISSIONING AND ROUTINE START-UPS

**NOTE:** The DPS has been factory preset to 7 psi.

### NEVER ADJUST!!

**First Commissioning** - Check the following prior to startup:

1. Check that the line pressure will always be at least 25 psig at the filter inlet during the rinse cycle with the Solenoid Valve energized (the preferred minimum is 30 psig).
2. Check that there are no upstream pipeline restrictions.
3. Check that the filter is mounted in the correct flow orientation as indicated by the arrows on the filter body.
4. Check that the Solenoid Valve vent tubing is open to the atmosphere and not kinked or bent.
5. Check that tubing connections are completed as shown on the attached installation drawings.
6. Check that the Solenoid Valve has been properly wired as indicated in the schematic provided with the OMNITROL O&M Manual Supplement.
7. Check that the filter inlet and outlet isolation valves are closed, and the bypass valve is open.
8. Refer to the OMNITROL O&M Manual Supplement and set the rinse duration for to 8-10 seconds.

### Start-Up

1. Slowly open the inlet isolation valve to the filter, allowing the filter to pressurize.
2. Check for any external leakages and eliminate.
3. Check to ensure that the filter inlet pressure is higher than 25 psig (a minimum of 30 psig is preferred).
4. Close the bypass valve to deadhead the filter and initiate a manual rinse cycle as described in the following section.
5. If the filter's rinse cycle appears to be completed OK, then open the outlet valve for normal flow and filtering.
6. Observe LOW pressure and verify that this pressure drops. When this pressure drops by about 7 psi, an automatic rinse cycle should start. It is recommended that at least one automatic rinse cycle be observed to ensure that the system is operating properly.

## MANUAL FLUSHING PROCEDURES

Periodically, it may be necessary to activate a manual rinse cycle of the filter. Some typical reasons are:

- Routine inspection of proper filter operation.
- Emergency cleaning of the filter.
- Troubleshooting/start-up.
- Drainage of the filter prior to maintenance.

**Using the OMNITROL 401 or 150** - The manual rinse is activated with the Controller by pressing and holding the **RESET** button on the side of the controller enclosure.

## SHUT DOWN AND DRAINAGE PROCEDURES

The filter may have to be shut down periodically, for several reasons, including servicing, winterizing, etc.

When the filter is to be shut down for a long period of time, such as protection for the winter, it is recommended to be sure that the filtration chamber, Solenoid Valve and control tubing are emptied of water. The screen should also be removed, cleaned, dried and reinstalled.

**Shut Down** - To shut down the filter, use the following procedure:

1. Open the bypass valve.
2. Close the isolating valve on the outlet of the filter.
3. Initiate a manual rinse as described previously.
4. Close the isolating valve on the inlet of the filter.
5. Initiate an additional manual rinse cycle to relieve the pressure in the filter.

**Drainage Procedure** - To empty the filter:

1. Perform the shut down procedure as described above.
2. Check the pressure in the filter housing to ensure that it is atmospheric. If not, initiate manual rinses until the pressure is atmospheric.
3. Remove the tubing from the fitting on the filter's cover to vent the filter.
4. Remove the tubing, fitting and brass mini-filter at the port at the bottom of the filter to allow any remaining water in the filter to drain.
5. After draining, replace tubing, fitting & filter.

## SCHEDULE OF PREVENTIVE MAINTENANCE AND INSPECTIONS

### Annually:

1. Remove screen and clean any stubborn or deeply embedded particles that may be in the screen's mesh.
2. Inspect the screen for damage and replace if required.
3. Re-assemble and trigger a manual rinse cycle and check for proper filter function.

## ELECTRICAL CONTROL SYSTEMS

The **OMNITROL 401** is a powerful, yet simple Controller, which provides for control for the filter. Power is 110 Vac or 220 Vac. Most ORV Series filters are supplied with this controller.

The **OMNITROL 150** is a powerful, yet simple Controller, powered by four (4) C size alkaline batteries. This controller is used whenever AC power is not available.

Other OMNITROL controllers are available for special applications or installations. Please consult the main office listed below.

## SPECIAL INSTALLATIONS

The prior sections of this manual describe typical filters and typical installations. Since every installation is different, this section describes unusual conditions and the special instructions that need to be followed to correctly install the filter(s) and special options and accessories.

**Pneumatic Control Conversion** - Occasionally, conditions may arise that require the use of compressed air to operate the filter control system rather than filtered water. We refer to this system as a pneumatically controlled filter. Some typical applications are:

- To provide freeze protection when a filter is to be installed outdoors.
- To insure proper filter rinsing when available water pressure is too low.
- When water quality precludes the use of water in the Control System.

In this system, dry, filtered compressed air is distributed as the working fluid in the Control System, rather than pressurized vessel water. The pneumatic control system utilizes most of the same components as the standard control system, allowing it to be easily retrofitted to existing installations.

The following changes occur when installing a pneumatic control system in an ORV series filter:

- The Normally Open 3-way solenoid valve is supplied with air rather than water at inlet pressure. The air pressure should be approximately 10-15 psig higher than the inlet pressure to the filter for proper operation.
- A fluid filled absorber tank is added to the piston's control tubing line to act as a shock absorber between the air and the piston head.
- The Differential Pressure Switch (DPS) remains as the only component that requires water for proper operation. For freeze protection, precautions must be taken to ensure that these lines are adequately protected against freezing.

To install a pneumatic control system on a new filter, the following steps should be followed:

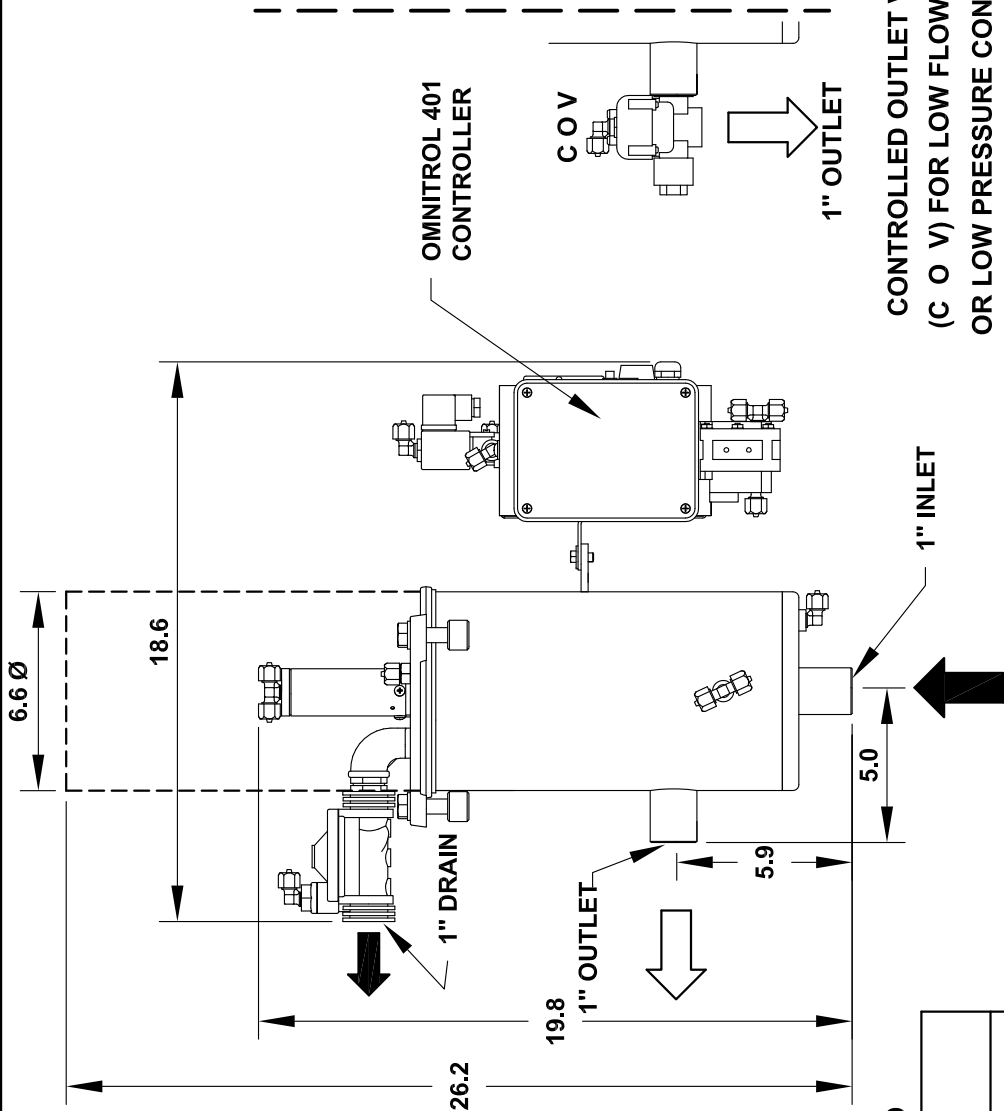
1. Disconnect all tubing connections to the 3-way mini valve and remove the tubing from the opposite end.
2. Replace the 1/8" TEE fitting on the solenoid's top with a 1/8" elbow.
3. Replace the 1/8" TEE fitting at the filter's inlet with a 1/8" elbow and connect tubing to the high side of the Differential Pressure Switch. For freeze protection, use heat traced stainless steel tubing and fittings.
4. Replace the 1/4" TEE fitting on the filter's lower side with a 1/4" elbow and connect tubing to the low side of the Differential Pressure Switch. For freeze protection, use heat traced stainless steel tubing and fittings.

5. Remove the 1/4" elbow on the filter's upper section and replace it with a 1/4" plug.
6. Connect a dry compressed air line (at least 10-15 psig higher than filter inlet pressure) to the 1/8" elbow fitting at the top of the solenoid valve.
7. Mount the absorber tank with its side fill port facing up. Locate this tank near the piston and slightly higher than the piston.
8. Connect the control tubing to the 1/8" side elbow fitting of the solenoid as per the pneumatic control tubing diagram. A TEE fitting from this tubing branches the pressure from the solenoid to the Rinse Valve and the Hydraulic Piston.
9. Connect the Piston in series with the absorber tank (branch of TEE to the top of tank, bottom of tank to the piston).
10. Use a 50/50 water/anti-freeze mixture to fill the absorber tank and piston cylinder. Remove the absorber tank's side fill port plug and slowly fill the tank with the fluid mixture. Plug the port when the fluid overflows.
11. Apply the compressed air supply to the top of the solenoid. This will force some of the fluid in the tank into the line to the piston and will push the piston downward and fill the pistons cylinder with the fluid.
12. Remove the air pressure from the top of the solenoid, then remove the tank's plug and refill the port until overflowing, and plug the port.
13. Continue with the installation of the filters following the instructions in the O&M Manual.

**Using a Controlled Outlet Valve (COV)** - A Controlled Outlet Valve (COV for short) is a valve installed on the outlet of the filter, and is used to control the flow through the filter during the rinsing cycle. A COV is used when inlet pressures are low or drop below the 30 psi minimum with the rinse valve open. In most cases, the Controller will activate the COV prior to rinse valve activation. This throttles the flow out of the filter's outlet, to develop more inlet pressure to better provide adequate pressure for a proper rinse.

A COV is installed on the outlet leg of the filter, usually before the outlet isolation valve. For multiple filter installations, the COV is located at a point on the main line after the multiple filter outlets are rejoined.

**FREE SPACE REQUIRED FOR MAINTENANCE**



Orival Inc. reserves the right to modify filter dimensions without prior notice.

**ALL DIMENSIONS IN INCHES UNLESS INDICATED**

**TECHNICAL DATA**

MAXIMUM FLOW RATE:	27 G.P.M.
AVAILABLE SCREEN MICRON SIZES:	5, 10, 15, 25, 30, 40, 50, 80, 100, 120, 150, 200, 400, 800, 1000, 1500, 3000
OPEN AREA STD. SCREEN :	42 SQ. INCHES
OPEN AREA HIGH PERFORMANCE SINTERED MULTI-LAYERED SCREEN:	63 SQ. INCHES
MAXIMUM WORKING PRESSURE:	120 PSIG
MINIMUM INLET PRESSURE	30 PSIG
REQUIRED DURING RINSE CYCLE:	150°F
MAX. WORKING TEMPERATURE:	3/4" & 1"
INLET/OUTLET CONNECTIONS:	1"
DRAIN VALVE CONNECTION:	1" MINIMUM
DRAIN HEADER SIZE:	52 LBS.
APPROX. EMPTY WEIGHT:	65 LBS.
APPROX. FULL OF WATER WEIGHT:	

**DATA SHEET**  
**ORV-100-LE**  
 AUTOMATIC SELF-CLEANING FILTER

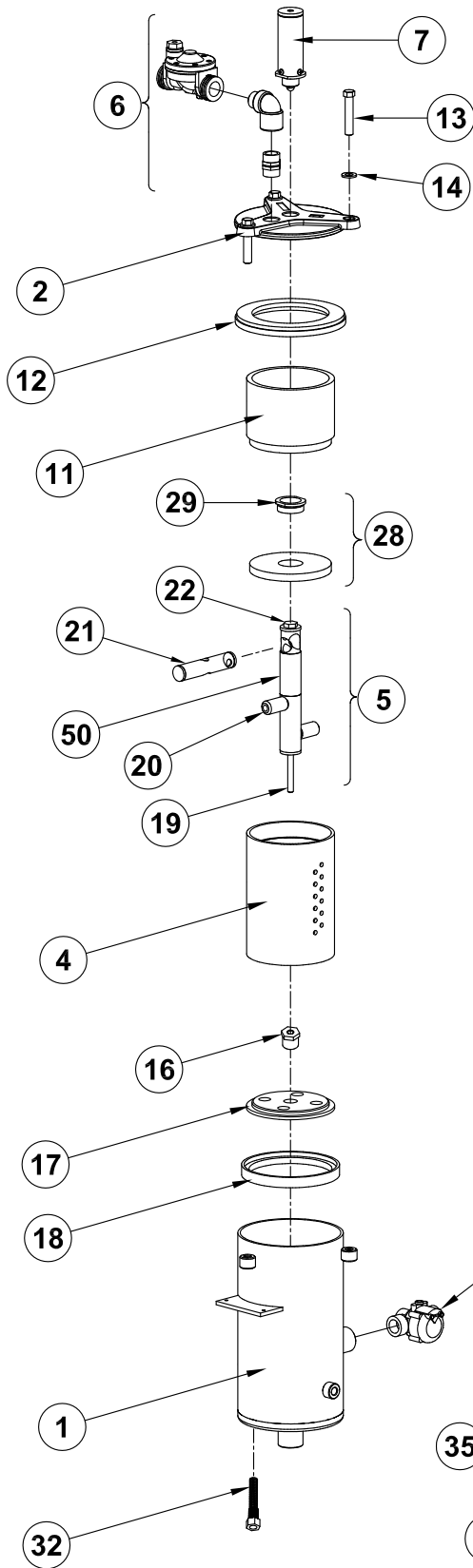
**CONTROLLED OUTLET VALVE (C O V) FOR LOW FLOW AND/OR LOW PRESSURE CONDITIONS**  
 1" INLET, OUTLET AND DRAIN PORTS SHOWN. 3/4" ADAPTERS SUPPLIED WITH ORV-075-LE

**ORIVAL, INC.**  
 213 S. VAN BRUNT ST.  
 ENGLEWOOD, N.J. 07631  
 TEL (800) 567-9767, (201) 568-3311  
 FAX (201) 568-1916  
 www.orival.com  
 filters@orival.com



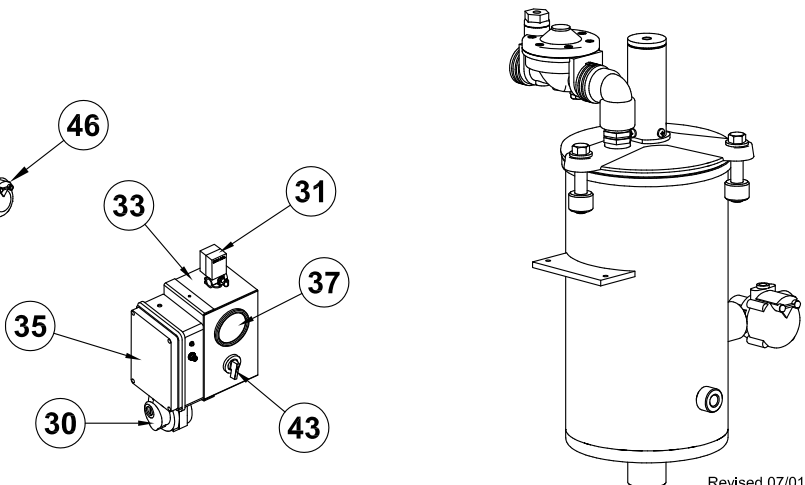
# TYPICAL ORV SERIES FILTER ASSEMBLY

## Exploded View For Models ORV-075-LE and ORV-100-LE

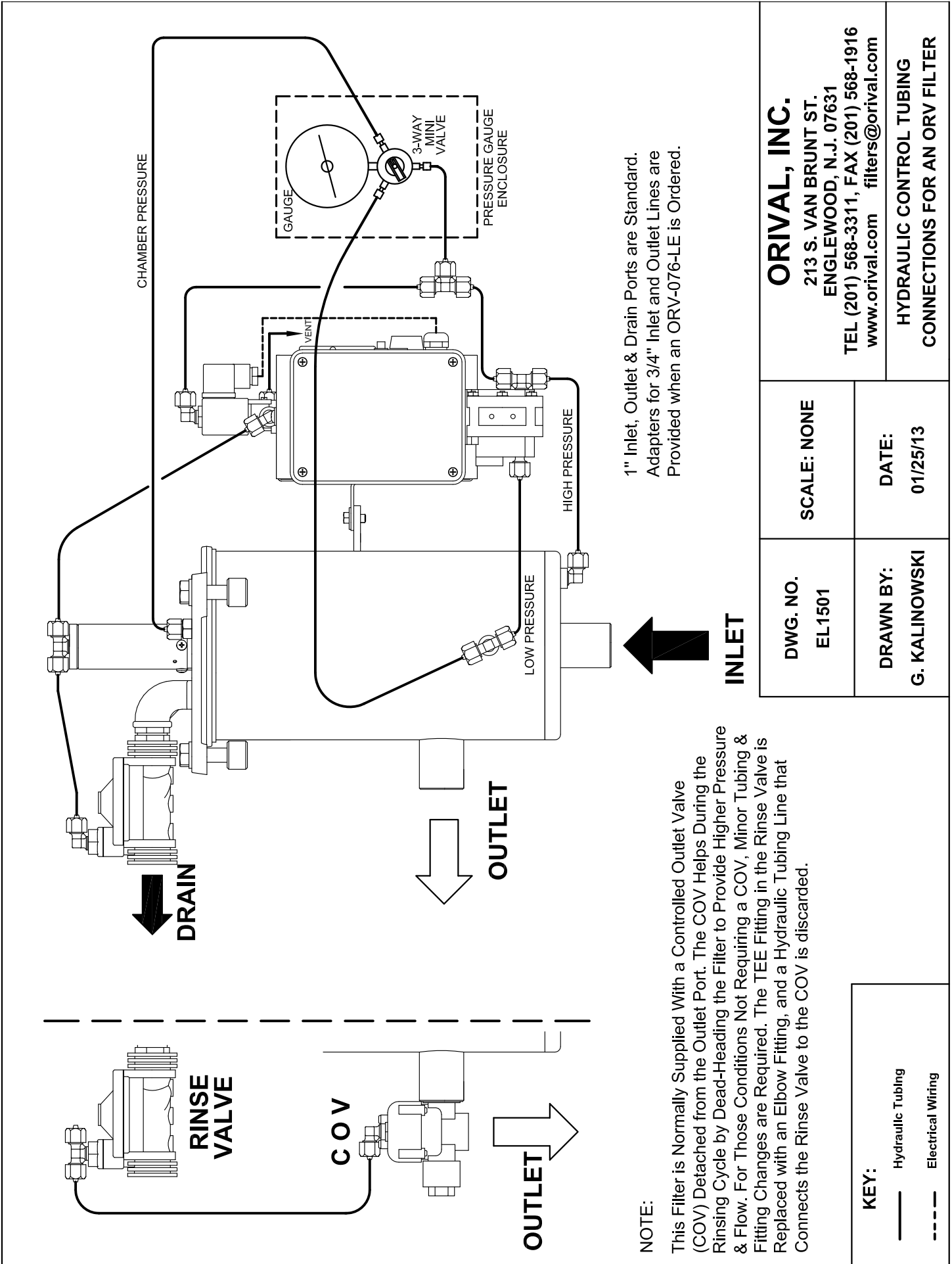


No.	Description	Part #
1	Filter body	V01AE00
2	Cover	V02AE00
4	Fine Screen Assembly (15 - 3000 micron only)** Supplied with P/N 16BE00 and V17BE00	V4*AE00
4	High Performance Fine Screen (5 - 3000 micron)** Supplied with P/N 16BE00 and V17BE00	V4*AE17
5	Dirt Collector Assembly with Nozzles and St/St Shaft Supplied with P/N V21AE00, V22AE13 and V50AE13	V05AE00
6	1" Rinse Valve Assembly - Engineered Plastic	G06AE00
6	1" Rinse Valve Assembly - Metal	G06AE01
7	Hydraulic Piston Assembly	V07AE13
11	Hydraulic Motor Chamber Spacer - PVC	V11AE00
12	Cover/Housing Seal	V12AE00
13	1/2" Cover Bolt - St/St	V13AE13
14	1/2" Cover/Housing Washer - St/St	14BE13
16	Shaft Bearing/Upper Bearing - Brass	16BE00
17	Fine Screen Handle	V17BE00
18	Fine Screen Inner Gasket	V18AE00
19	Dirt Collector Shaft - St/St	V19AE13
20	Dirt Collector Nozzle - PVC	V20AE00
21	Hydraulic Motor - PVC	V21AE00
22	Dirt Collector Plug - St/St	V22AE13
28	Separator Plate and Bearing Assembly	V28AE00
29	Dirt Collector Bearing - Brass	V29AE00
30	Differential Pressure Switch	30BE00
31	Solenoid Valve, 24 Vac, 3-Way, N.O.	31BE00
32	1/4" Mini Filter with 1/8" Port	G32AE00
33	Pressure Gauge Enclosure	G33AE00
35	OMNITROL 401 Controller	-----
37	Pressure Gauge	G37AE00
43	Three Way Mini Valve	43BE00
46	1" Controlled Outlet Valve	V46AE00
50	Dirt Collector Bearing Sleeve - St/St	V50AE13

\* Z - 5 micron, Y - 10 micron, A - 15 micron, B - 25 micron, C - 30 micron, D - 40 micron, E - 50 micron, F - 80 micron, G - 100 micron, H - 120 micron, J - 150 micron, K - 200 micron, L - 400 micron, P - 800 micron, N - 1000 micron, P - 15000 micron, Q - 3000 micron



Revised 07/01/16



1" Inlet, Outlet & Drain Ports are Standard.  
Adapters for 3/4" Inlet and Outlet Lines are  
Provided when an ORV-076-LE is Ordered.

**ORIVAL, INC.**  
213 S. VAN BRUNT ST.  
ENGLEWOOD, N.J. 07631  
TEL (201) 568-3311, FAX (201) 568-1916  
www.orival.com filters@orival.com

HYDRAULIC CONTROL TUBING  
CONNECTIONS FOR AN ORV FILTER

DWG. NO.  
EL1501

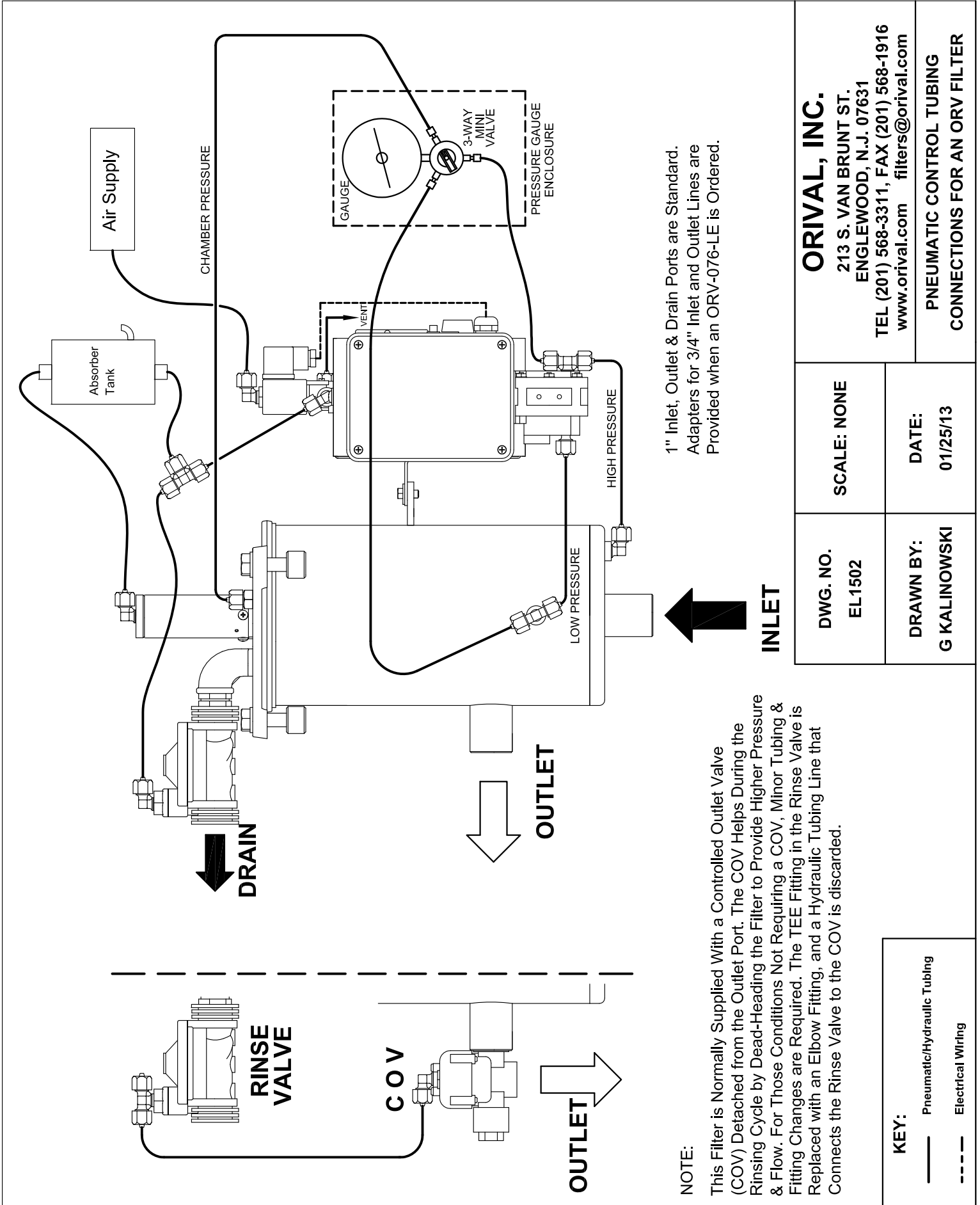
SCALE: NONE

DRAWN BY:  
G. KALINOWSKI

DATE:  
01/25/13

**NOTE:**  
This Filter is Normally Supplied With a Controlled Outlet Valve (COV) Detached from the Outlet Port. The COV Helps During the Rinsing Cycle by Dead-Heading the Filter to Provide Higher Pressure & Flow. For Those Conditions Not Requiring a COV, Minor Tubing & Fitting Changes are Required. The TEE Fitting in the Rinse Valve is Replaced with an Elbow Fitting, and a Hydraulic Tubing Line that Connects the Rinse Valve to the COV is discarded.

**KEY:**  
 — Hydraulic Tubing  
 - - - Electrical Wiring



1" Inlet, Outlet & Drain Ports are Standard. Adapters for 3/4" Inlet and Outlet Lines are Provided when an ORV-076-LE is Ordered.

**ORIVAL, INC.**

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 www.orival.com filters@orival.com

**PNEUMATIC CONTROL TUBING CONNECTIONS FOR AN ORV FILTER**

<b>DWG. NO.</b> EL1502	<b>SCALE:</b> NONE
<b>DRAWN BY:</b> G KALINOWSKI	<b>DATE:</b> 01/25/13

**INLET**

**DRAIN**

**OUTLET**

**RINSE VALVE**

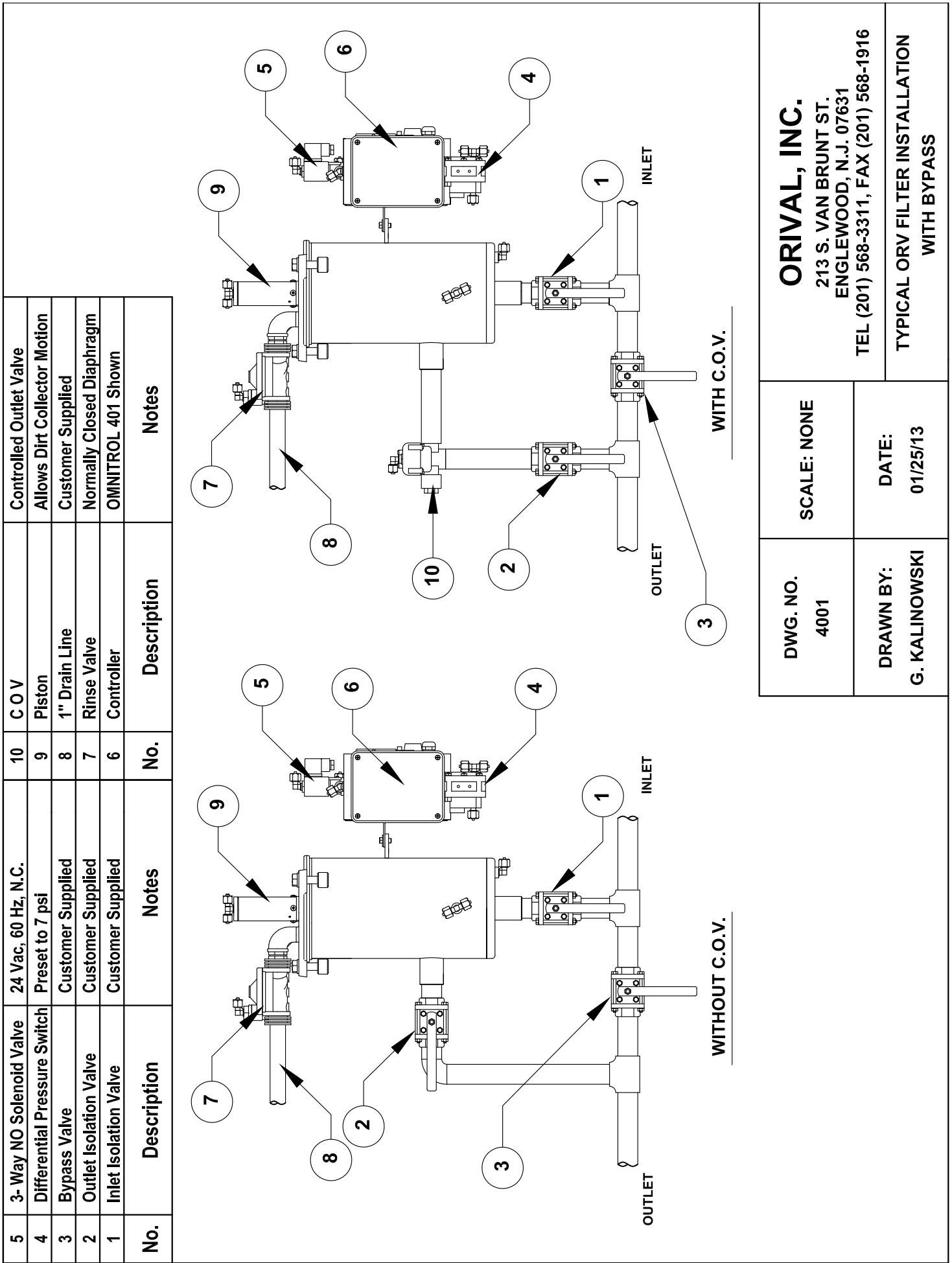
**COV**

**OUTLET**

**NOTE:**  
 This Filter is Normally Supplied With a Controlled Outlet Valve (COV) Detached from the Outlet Port. The COV Helps During the Rinsing Cycle by Dead-Heading the Filter to Provide Higher Pressure & Flow. For Those Conditions Not Requiring a COV, Minor Tubing & Fitting Changes are Required. The TEE Fitting in the Rinse Valve is Replaced with an Elbow Fitting, and a Hydraulic Tubing Line that Connects the Rinse Valve to the COV is discarded.

**KEY:**

—	Pneumatic/Hydraulic Tubing
- - -	Electrical Wiring



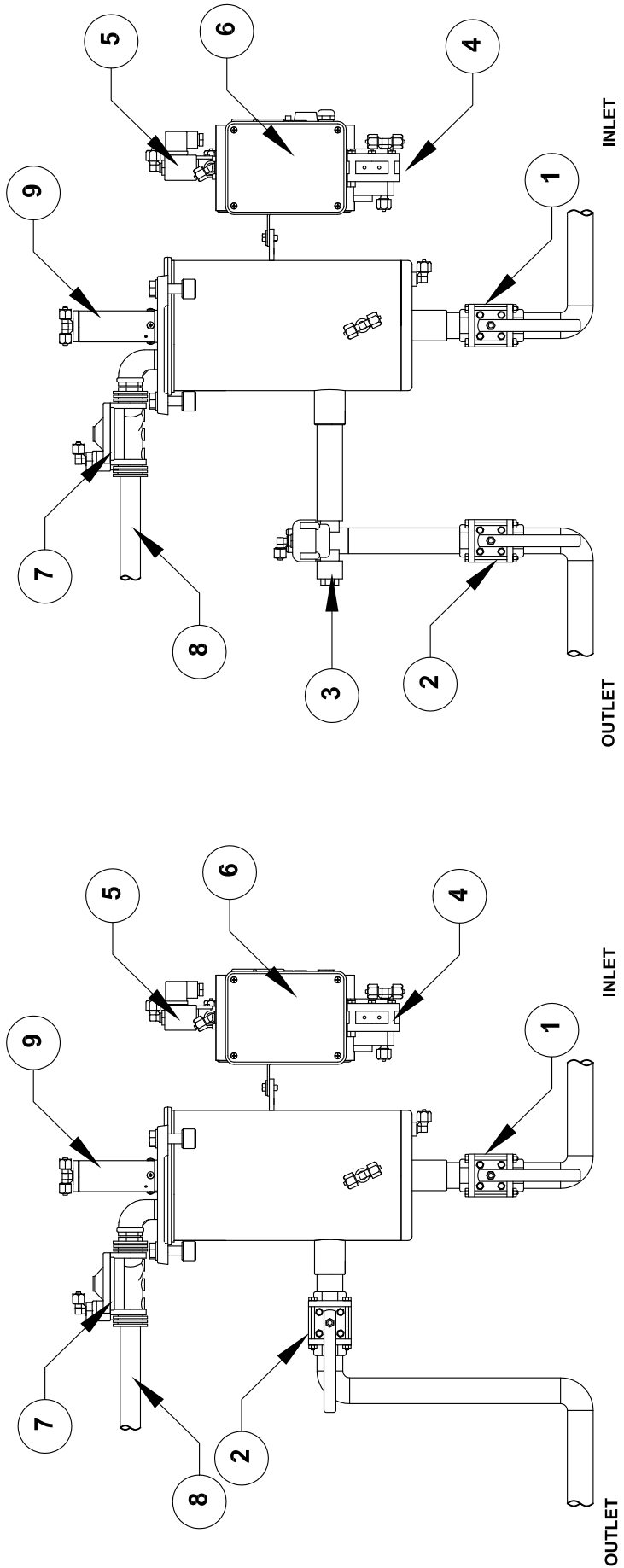
No.	Description	Notes	No.	Description	Notes
5	3-Way NO Solenoid Valve	24 Vac, 60 Hz, N.C.	10	C O V	Controlled Outlet Valve
4	Differential Pressure Switch	Preset to 7 psi	9	Piston	Allows Dirt Collector Motion
3	Bypass Valve	Customer Supplied	8	1" Drain Line	Customer Supplied
2	Outlet Isolation Valve	Customer Supplied	7	Rinse Valve	Normally Closed Diaphragm
1	Inlet Isolation Valve	Customer Supplied	6	Controller	OMNITROL 401 Shown

DWG. NO. 4001	SCALE: NONE
DRAWN BY: G. KALINOWSKI	DATE: 01/25/13

**ORIVAL, INC.**  
 213 S. VAN BRUNT ST.  
 ENGLEWOOD, N.J. 07631  
 TEL (201) 568-3311, FAX (201) 568-1916

TYPICAL ORV FILTER INSTALLATION  
 WITH BYPASS

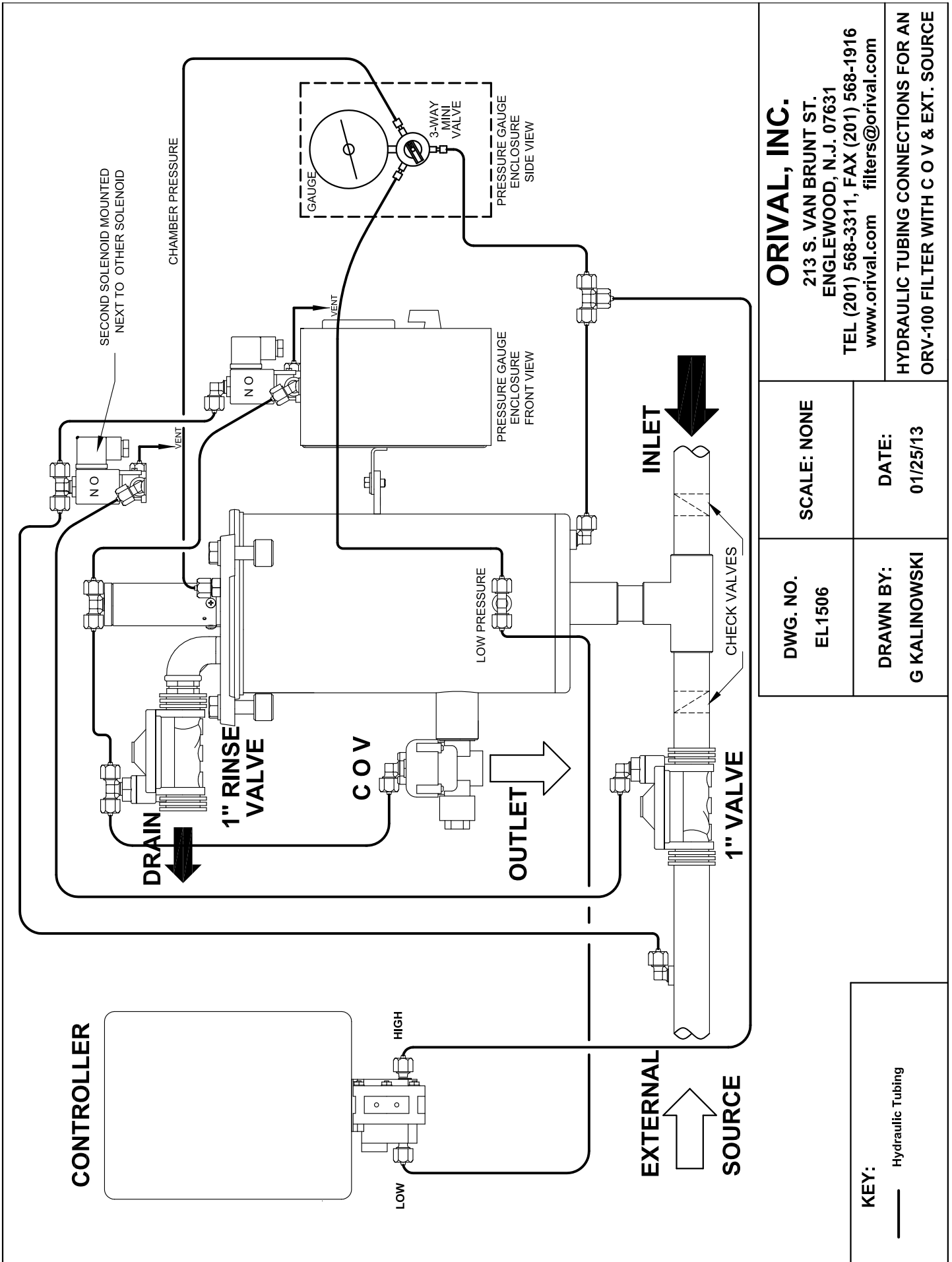
5	3- Way NO Solenoid Valve	24 Vac, 60 Hz, N.C.	9	Piston	Allows Dirt Collector Motion
4	Differential Pressure Switch	Preset to 7 psi	8	1" Drain Line	Customer Supplied
3	C O V	Controlled Outlet Valve	7	Rinse Valve	Normally Closed Diaphragm
2	Outlet Isolation Valve	Customer Supplied	6	Controller	OMNITROL 401 Shown
1	Inlet Isolation Valve	Customer Supplied	5	3- Way NO Solenoid Valve	24 Vac, 60 Hz, N.C.
No.	Description	Notes	No.	Description	Notes



WITH C.O.V.

WITHOUT C.O.V.

DWG. NO. 4002	SCALE: NONE	<b>ORIVAL, INC.</b> 213 S. VAN BRUNT ST. ENGLEWOOD, N.J. 07631 TEL (201) 568-3311, FAX (201) 568-1916
DRAWN BY: G. KALINOWSKI	DATE: 01/25/13	



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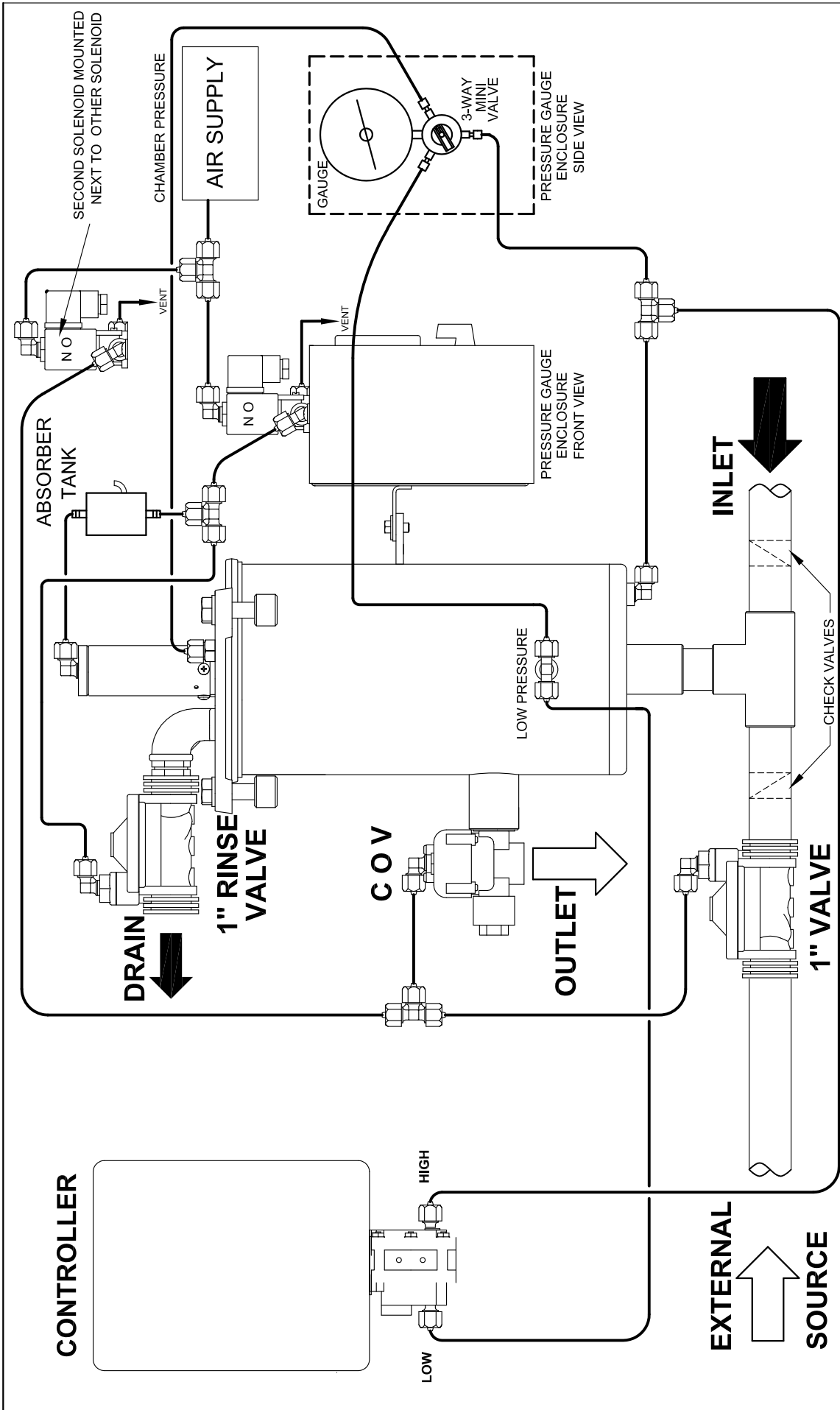
**HYDRAULIC TUBING CONNECTIONS FOR AN ORV-100 FILTER WITH C O V & EXT. SOURCE**

**DWG. NO.**  
 EL1506

**SCALE:** NONE

**DRAWN BY:**  
 G KALINOWSKI

**DATE:**  
 01/25/13



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 213 S. VAN BRUNT ST.  
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 TEL (201) 568-3311, FAX (201) 568-1916  
 www.orival.com filters@orival.com

**PNEUMATIC TUBING CONNECTIONS FOR AN ORV-100 FILTER WITH COV & EXT. SOURCE**

<b>DWG. NO.</b> EL1507	<b>SCALE:</b> NONE
<b>DRAWN BY:</b> G KALINOWSKI	<b>DATE:</b> 01/25/13

**KEY:**  
 — Hydraulic Tubing

# Bag Filter



# BF Series

Single Bag Housings: #1, #2, #3 and #4 sizes



- Designed for industrial and commercial filter applications
- Heavy duty construction for maximum durability
- 1/8" perforated stainless steel basket (optional perforations and mesh sizes available)
- #1 and #2 Size Housings:
  - Available in 316L Stainless Steel, 304L Stainless Steel or Carbon Steel construction for a wide range of chemical compatibility
  - Clamp or Swing Bolt closures
  - Stainless steel compression spring provides positive bag sealing
  - Adjustable stainless steel leg assembly
  - 1/4" FNPT gauge ports and 1/2" FNPT drain port
- #3 and #4 Size Housings:
  - 316 Stainless Steel construction
  - Clamp closure for easy bag change outs
  - Optional compression spring and adjustable mounting legs

## Applications

Water	Chemicals
Food & Beverage	Electronics
Oil	Inks / Paints / Coatings
Coolants	Pulp & Paper

## Specifications & Operating Parameters

### Maximum Operating Pressure

150 psig (10.3 bar) @ 300°F (149°C)

### Connections

Inlet /Outlet:

2" FNPT (#1 and #2 Sizes)

3/4", 1" and 1 1/2" FNPT (#3 and #4 Sizes)

*Optional: RF Flanges or Sanitary Ferrules*

Drain Port: 1/2" FNPT (#1 and #2 Sizes)

Gauge Ports: 1/4" FNPT - clean and dirty sides (#1 and #2 sizes)

Vent Port: 1/4" NPT Plug

### Gaskets

Buna N

*Optional: EPR, Silicone, Teflon Encapsulated Silicone, Viton*

### Baskets

1/8" perforated stainless steel

*Options: various perforation and mesh sizes*

### Materials of Construction

Head / Shell:

#1 and #2 Sizes

316L Stainless Steel, 304L Stainless Steel, Carbon Steel

#3 and #4 Sizes

316L Stainless Steel

Eye Nuts: Zinc plated steel

Mounting Legs: 304L Stainless Steel

### Options

- Side Inlet / Side Outlet (#1 and #2 sizes)

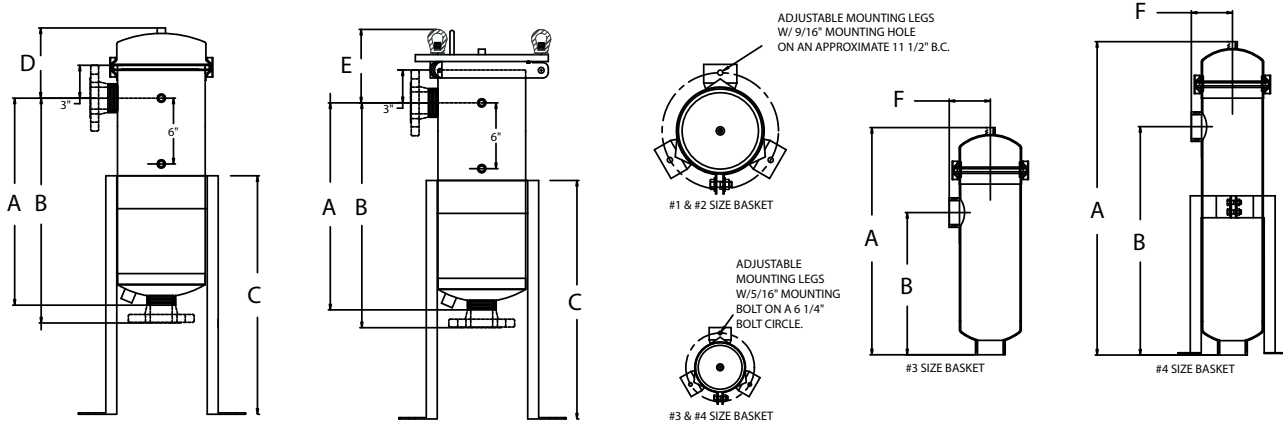
- 134 epoxy coating for seawater and corrosive applications

*See ordering guide for complete selection of options*

MODEL AND BAG SIZE	CLOSURE	MAX FLOW RATE* GPM (LPM)	DRAIN SIZE	DIMENSIONS					
				A	B	C	D	E	F
BFS-1 / BFC-1	Clamp or Swing Bolt	70 (265)	1/2"	18 7/8" (47.9 cm)	20 1/2" (52.1 cm)	21 3/4" (55.2 cm)	3" (7.6 cm)	6 11/16" (17.0 cm)	3" (7.6 cm)
BFS-2 / BFC-2	Clamp or Swing Bolt	150 (567)	1/2"	34 7/8" (88.6 cm)	22 3/4" (92.7 cm)	21 3/4" (55.2 cm)	3" (7.6 cm)	6 11/16" (17.0 cm)	3" (7.6 cm)
BFS-3	Clamp	25 (95)		16 9/16" (42.1 cm)	10 3/8" (26.4 cm)				
BFS-4	Clamp	40 (151)		22 7/8" (58.1 cm)	16 11/16" (42.4 cm)				

\*Flow rates are guidelines only. Actual flow rates are based upon fluid, viscosity, bag type, micron ratings and other factors

## Dimensions



## Ordering Guide (Example: BFS-2SB-2-316-B)

BFS - 2		SB - 2		316		B	
MODEL	BAG SIZE	CLOSURE	PIPE SIZE	MATERIAL	CONNECTION ORIENTATION	GASKET	
<b>#1 and #2 Sizes</b>							
BFS = Stainless Steel BFC = Carbon Steel	1 2	C = Clamp SB = Swing Bolt	2 = 2" FNPT (standard) 2F = 2" RF Flange 3 = 3" FNPT 3F = 3" RF Flange 2TC = 2" Sanitary Ferrules	304 = 304 SS 316 = 316 SS 134 = 134 Coating over 304 SS*	Blank = Side In / Bottom Out 2 = Side In / Side Out	B = Buna N (Standard) E = EPDM S = Silicone V = Viton	
<b>#3 and #4 Sizes</b>							
BFS = Stainless Steel	3 4	C = Clamp	75 = 3/4" FNPT 1 = 1" RF Flange 1.5 = 1 1/2" FNPT (standard)	316 = 316 SS	Blank = Side In / Bottom Out 2 = Side In / Side Out (Hold Down Spring Recommended)	B = Buna N (Standard) E = EPDM S = Silicone V = Viton	

\* Note: 134 Coating must have swing bolt closure and flanged connections.

## Customization

Housings may be customized to meet your precise requirements. Contact Shelco's technical support staff or your distributor for more information.



### Shelco Filters

100 Bradley Street  
Middletown, CT 06457 USA

Tel: 800-543-5843 / Fax: 860-854-6120 / E-mail: [info@shelco.com](mailto:info@shelco.com)

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# BF CLAMP SERIES FILTERS

MODELS BFC-1C, BFC-2C, BFS-1C, BFS-1C316, BFS-2C, BFS-2C316  
INSTALLATION, OPERATION and MAINTENANCE MANUAL

## **WARNING:**

***Models BFC-1C and BFC-2C are constructed of carbon steel and are not suitable or warranted for use in water or corrosive applications.***

***The filter must be protected from freezing to prevent cracking, which would result in leakage.***

---

## **MAXIMUM OPERATING PRESSURE:**

**150 PSI (10 BAR) @ 300 °F (149 °C)**

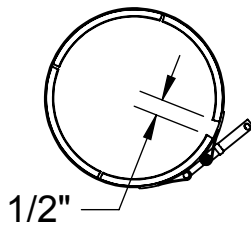
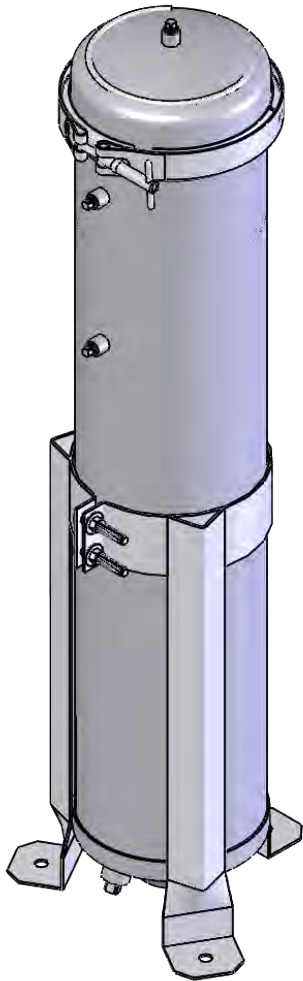
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## **INSTALLATION**

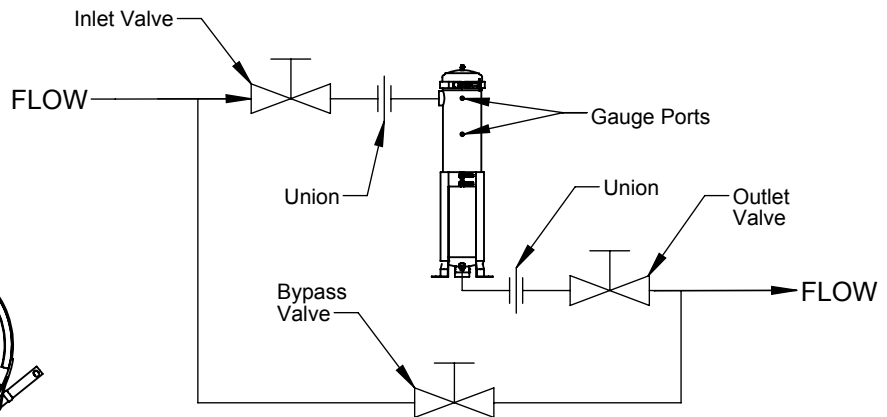
A recommended installation is shown in FIGURE 1 below with shut-off and bypass valves to isolate the housing for ease of changing bags. Also recommended is the installation of unions on either side of the filter to facilitate installation and removal of the housing. Ensure that the direction of flow shown below is consistent with your process. **DO NOT INSTALL BACKWARDS.**

The housing must be mounted securely to your base or floor so that stress is not exerted on the housing or piping. Failure to properly install the filter housing could result in leakage.

Gauge ports (1/4" NPT) are included on the front of the housing. Installation of suitable pressure gauges to indicate pressure differential between inlet and outlet will assist in determining the remaining service life of the filter bag.



**FIGURE 2**



**FIGURE 1**

## **BAG INSTALLATION OR REPLACEMENT**

1. Close inlet and outlet valves and open the bypass valve. Open drain and allow sump to drain.
2. Loosen the cover clamp nut and remove the T-bolt from the retainer.
3. Remove the cover clamp and head. Remove the hold-down spring then remove the used bag. Check the condition and alignment of the basket seal. Clean the sealing surfaces and reposition or replace the seal as necessary.
4. Install the new bag in the basket, taking care to distribute the bag material evenly within the basket. Refit the hold-down spring.
5. It is recommended that the closure gasket be replaced at the same time the bag is replaced. Before replacing the cover assembly, ensure that there is no debris on the sealing surfaces. Replace the head and cover clamp and tighten the T-bolt so that there is a gap of approximately 1/2" between the V-band segments (See FIGURE 2).
6. Refit the drain plug and open the vent plug. Close the bypass valve and gradually open the inlet and outlet valves. When the fluid streams out of the vent, refit the plug. Open the inlet and outlet valves fully.

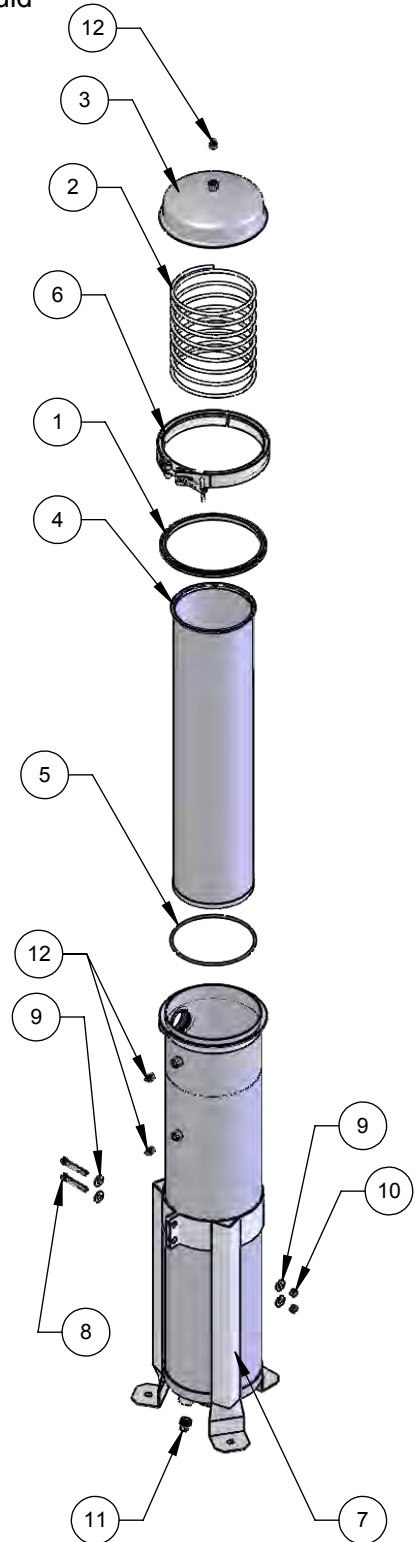
## MAINTENANCE

Shelco filters generally require very little maintenance. The filter bag should be replaced when the pressure drop across the filter reaches a maximum of 15 PSI. Your experience might dictate more frequent bag replacement. The gaskets should be inspected and replaced if necessary at the time the bag is replaced.

Bag Filter Spare Parts (Clamp Closure)								
Item	Model	BFC-1C	BFC-2C	BFS-1C	BFS-1C316	BFS-2C	BFS-2C316	Qty.
Item	Description	Part No.	Part No.	Part No.	Part No.	Part No.	Part No.	Qty.
1	Cover Gasket*	8017-B	8017-B	8017-B	8017-B	8017-B	8017-B	1
2	Hold-down Spring	8704-S	8704-S	8704-S	8704-S	8704-S	8704-S	1
3	Cover	8002-C	8002-C	8002-S	8002-S316	8002-S	8002-S316	1
4	Basket**	8702-S	8702-S	8702-S	8702-S	8702-S	8702-S	1
5	Basket Seal*	8725-B	8725-B	8725-B	8725-B	8725-B	8725-B	1
6	Clamp Assembly	8005-S	8005-S	8005-S	8005-S	8005-S	8005-S	1
7	Adjustable Legs	8706-C	8706-C	8706-S	8706-S316	8706-S	8706-S316	1
8	Screw, Legs	2122	2122	2122	2122	2122	2122	2
9	Washer, Legs	3020	3020	3020	3020	3020	3020	4
10	Nut, Legs	2023	2023	2023	2023	2023	2023	2
11	Plug, 1/2" npt	8011-C	8011-C	8011-S	8011-S316	8011-S	8011-S316	1
12	Plug, 1/4" npt	2103-C	2103-C	2103-S	2103-S316	2103-S	2103-S316	3

\* Standard gasket material is Buna N for temperatures up to 180°F. Consult your Shelco representative for your specific fluid and temperature.

\*\* Consult your Shelco representative for complete basket specifications



## Limited Warranty

Seller warrants each of the products described herein, under normal use and service, and subject to the user's compliance with these and any other operating instructions and directions given by the seller to be free from defects in materials or workmanship for a period of one year from date of shipment from seller's plant. Seller's liability under this warranty shall be limited to repairing or replacing any such defective products, at the seller's option, FOB seller's plant in Middletown, CT and reimbursing purchaser's shipping costs subject to the following: (1) timely receipt of purchaser's written notice that such products are defective; (2) seller's written authorization to purchaser for the return of such products to seller with shipping charges prepaid, and (3) seller's inspection of and confirmation that such products are defective in materials or workmanship. If seller's inspection shows that the products returned are defective due to dirt, rust, or any foreign material not attributable to seller, improper usage, over-tightening of threads, abuse or incorrect reassembly in the field or other cause not due to seller's improper manufacture, seller will, subject to purchaser's written authorization, repair or replace such products at cost. Seller's factory inspection and testing will be made available to purchaser upon request.

THE WARRANTY IS IN LIEU OF ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF FITNESS OR MERCHANTABILITY. SELLER SHALL NOT BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES. NO REPRESENTATIVE OR SELLER HAS AUTHORITY TO MAKE ANY REPRESENTATIONS OR WARRANTIES EXCEPT AS STATED HEREIN. Under no circumstances shall Seller be liable to Buyer or any third party for any loss of profits or other direct or indirect costs, expenses, losses or consequential damages arising out of or as a result of any defects in or failure of its products or any part or parts thereof or arising out of or as a result of parts or components incorporated in Seller's equipment but not supplied Seller.

The warranty excludes the following: A) Filter housings used for filtering brackish water, sea water, or where analysis shows TDS or Chlorides are in excess of 1,000 ppm; B) Gaskets and O-rings, once used; C) Altered products; D) Products without Seller's identification label.

It is the purchaser's responsibility to make certain the filter is compatible with all materials procured. Stainless Steel is not 100% non-corrosive. It is the purchaser's responsibility to complete a comprehensive water analysis (including Chlorides, TDS, and pH) to determine suitability of material. It is the purchaser's responsibility to inform seller of any application where TDS levels are in excess of 1,000 ppm, and/or where chlorides are in excess of 1,000 ppm.



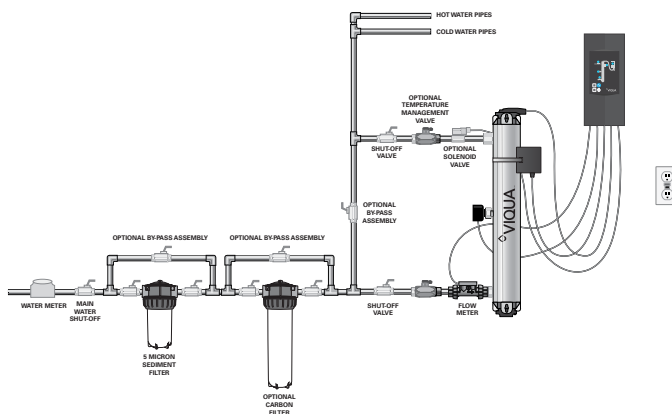
100 Bradley St. Middletown, CT 06457  
Ph: 800.543.5843 Fax: 860.854.6120  
www.shelco.com

UV Light

# Ultraviolet Water Disinfection Systems from VIQUA

The quality of drinking water can change with time and become contaminated with harmful bacteria. The **PROFESSIONAL** family of compact UV disinfection systems provide a **reliable, economical,** and **chemical-free** way to safeguard drinking water in any residential application. VIQUA's products have been designed and tested to ensure quality drinking water is at everyone's finger tips.





Regardless of your need, there is a VIQUA system to suit your requirements. The VIQUA H and K lines of products offer a range in flow rate from 45 GPM (10.2 m<sup>3</sup>/hr) to 80 GPM (18.2 m<sup>3</sup>/hr), which make them ideal for most light commercial applications.



## Features of VIQUA UV water disinfection systems

- The Professional systems use a revolutionary lamp with twice the output of current high-output lamps, giving you compact single-lamp systems that are half the size of their predecessors.
- The CoolTouch Fan significantly reduces water temperature and does not waste any water.
- For the sleeve bolts a quarter-twist to the positive stop and you're done. No tools, no risk of overtightening.
- Lamp connector is like a standard plug - no more grounding wires!
- New and improved sensor ensures safe UV levels are maintained.
- Our revolutionary amalgam lamps reduce maintenance requirements by lasting up to 2 years.
- Intuitive Interface - A picture is worth a thousand words.
- With plug-and-play color coded connections, it's as easy as "connect the dots."
- The optional COMMcenter displays UV dose and can monitor up to 9 UV systems - that's up to 720 gpm!
- Optional plug-and-play solenoid valve stops water flow in the event that water treatment is compromised.
- Even with the high flow capabilities, their footprint is half the size of their predecessors, making installation quicker and easier.

# Specifications

				
<b>MODEL</b>	H (650651; 650654)	H+ (650652; 650655)	K (660001-R; 660004-R)	K+ (660002-R; 660005-R)
<b>FLOW RATES</b>				
US Public Health (16 mJ/cm <sup>2</sup> )	48 GPM (180 lpm) (11.0 m <sup>3</sup> /hr)	48 GPM (180 lpm) (11.0 m <sup>3</sup> /hr)	120 GPM (454 lpm) (27.2 m <sup>3</sup> /hr)	120 GPM (454 lpm) (27.2 m <sup>3</sup> /hr)
VIQUA Standard (30 mJ/cm <sup>2</sup> )	45 GPM (170 lpm) (10.2 m <sup>3</sup> /hr)	45 GPM (170 lpm) (10.2 m <sup>3</sup> /hr)	80 GPM (303 lpm) (18.2 m <sup>3</sup> /hr)	80 GPM (303 lpm) (18.2 m <sup>3</sup> /hr)
NSF/EPA (40 mJ/cm <sup>2</sup> )	37 GPM (140 lpm) (8.4 m <sup>3</sup> /hr)	37 GPM (140 lpm) (8.4 m <sup>3</sup> /hr)	60 GPM (230 lpm) (13.7 m <sup>3</sup> /hr)	60 GPM (230 lpm) (13.7 m <sup>3</sup> /hr)
<b>DIMENSIONS</b>				
Dimensions	31" x 4" (78 cm x 10 cm)	31" x 4" (78 cm x 10 cm)	41" x 4" (103 cm x 10 cm)	41" x 4" (103 cm x 10 cm)
Inlet/Outlet Port Size	1 1/4" MNPT / 1" FNPT COMBO	1 1/4" MNPT / 1" FNPT COMBO	2" MNPT	2" MNPT
Shipping Weight	28 lbs (12.7 kg)	28 lbs (12.7 kg)	31 lbs (14 kg)	31 lbs (14 kg)
<b>ELECTRICAL</b>				
Voltage	100-240V / 50-60 Hz	100-240V / 50-60 Hz	100-240V / 50-60 Hz	100-240V / 50-60 Hz
Power Consumption	160 W	160 W	230 W	230 W
Maximum Operating Pressure	125 psi (8.62 bar)	125 psi (8.62 bar)	125 psi (8.62 bar)	125 psi (8.62 bar)
Ambient Water Temperature	2-40°C (36-104°F)	2-40°C (36-104°F)	2-40°C (36-104°F)	2-40°C (36-104°F)
<b>FEATURES</b>				
Visual "Power On"	YES	YES	YES	YES
Chamber Material	316L SS	316L SS	316L SS	316L SS
Audible Lamp Failure	YES	YES	YES	YES
Audible Lamp Replacement Reminder	YES	YES	YES	YES
UV Sensor	NO	YES	NO	YES
Sensor Reading Output	--	Optional	--	Optional
CoolTouch Fan	YES	YES	YES	YES

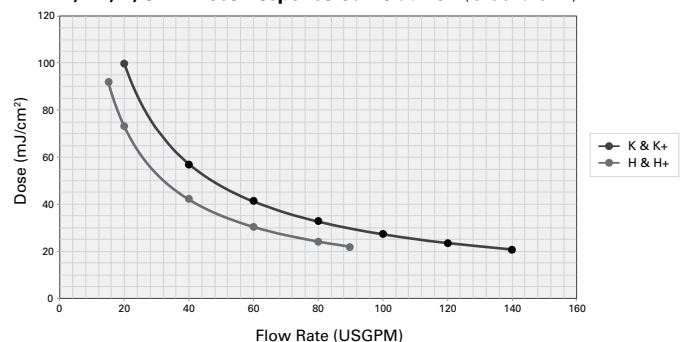
## Replacement Parts

<b>602855</b> – UV lamp for H & H+	<b>602856</b> – UV lamp for K & K+
<b>602975</b> – quartz sleeve for H & H+	<b>602976</b> – quartz sleeve for K & K+
<b>650580</b> – sensor for H+ & K+	<b>660018-R</b> ; – power supply for K
<b>650709-004</b> ; – power supply for H	<b>660019-R</b> ; – power supply for K+
<b>650709-005</b> ; – power supply for H+	

## Water Quality Parameters

Hardness: < 7 grains (120 mg/L)  
 Iron: < 0.3 mg/L  
 Tannins: < 0.1 mg/L

H, H+, K, & K+ Dose Response Curve at EOL (@ 95% UVT)

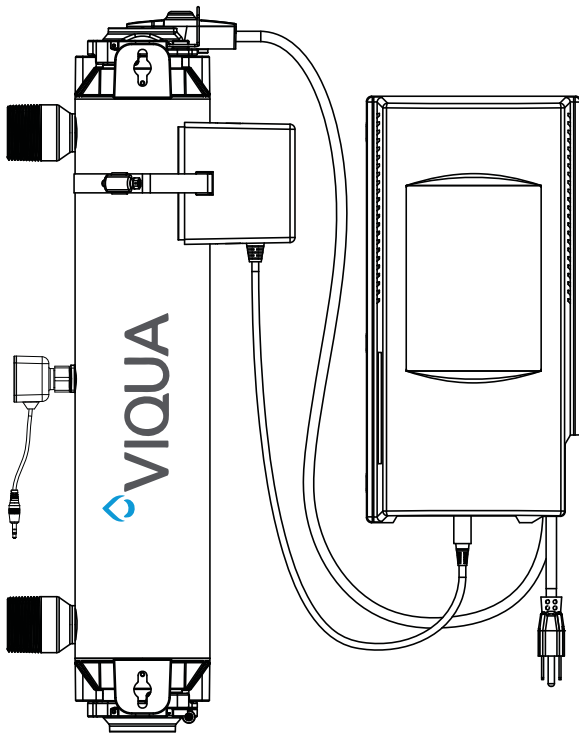


425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1  
 t. 1.519.763.1032 • f. 1.519.763.5069 • tf. 1.800.265.7246 (US/CAN) • t. +31.73.747.0144 (EUR)  
 • info@viqua.com • www.viqua.com

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# Owner's Manual



**Models:**

**H, K**

**Plus Models:**

**H+, K+**

**PRO Models:**

**PRO10, PRO20, PRO30, PRO50**

Powered by



425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1  
t. (+1) 519.763.1032 • tf. (+1) 800.265.7246 (US and Canada only)  
t. (+31) 73 747 0144 (Europe only) • f. (+1) 519.763.5069  
e-mail: [info@viqua.com](mailto:info@viqua.com)  
[www.viqua.com](http://www.viqua.com)



System Tested and Certified by  
NSF International against CSA  
B483.1 and NSF/ANSI 55 for  
Disinfection Performance, Class A



MEMBER





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## Congratulations

on the purchase of your ultraviolet (UV) water disinfection system! This system uses the most advanced UV technology on the market and is designed to provide you with years of trouble free operation with minimal maintenance required to protect your drinking water from microbiological contaminants.

To ensure ongoing disinfection of your water, UV lamps need to be replaced annually with VIQUA factory-supplied replacements. VIQUA lamps are the result of extensive development resulting in a highly efficient disinfection platform with extremely stable UV output over the entire 18000 hour lifetime. Its success has led to a proliferation of non-genuine copies in the market.

The UV lamp is the heart of the disinfection system, and there should be no compromise when it's time for a replacement.

Why should you insist on genuine factory supplied VIQUA replacement lamps?

- Use of widely available, non-genuine, replacement lamps has been shown to damage the control module of VIQUA UV disinfection equipment.
- An increasing number of calls to VIQUA Technical Support are connected with non-genuine lamps being used (unknowingly) as replacements.
- Damage arising from the use of non-genuine lamps poses a safety risk and is not covered by equipment warranty.
- Unless the UV equipment is equipped with a UV sensor (monitor), it is not possible to verify the UV (invisible) output of replacement lamps.
- Similar appearance to the original lamp and the presence of (visible) blue light does not mean equivalent disinfection performance.
- VIQUA replacement lamps undergo rigorous performance testing and strict quality control processes to ensure that the safety and performance certifications of the original equipment are not compromised.

So, you can see that it's simply not worth the risk! Insist on genuine VIQUA replacement lamps.


















# Section 1 Safety Information

These are the original instructions. Please read this entire manual before operating this equipment. Pay attention to all danger, warning, and caution statements in this manual. Failure to do so could result in serious personal injury or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired. DO NOT use or install this equipment in any manner other than that specified in the installation manual.



## 1.1 Potential Hazards:

Read all labels and tags attached to the system. Personal injury or damage to the system could occur if not observed.

	Waste electrical and electronic equipment (WEEE). This symbol indicates that you should not discard wasted electrical or electronic equipment (WEEE) in the trash. For proper disposal, contact your local recycling/reuse or hazardous waste center.		This symbol indicates not to store any combustible or flammable material close to the system.
	This symbol indicates there is Mercury present.		This symbol indicates that the contents of the transport package are fragile and the package should be handled with care.
	This is the safety alert symbol. Obey all safety messages that follow this symbol to avoid potential injury. When on the equipment, refer to the Operational and Maintenance manual for additional safety		This symbol indicates safety glasses with side protection is required for protection against UV exposure.
	This symbol indicates a risk of electrical shock and/or electrocution exists.		This symbol indicates gloves must be worn.
	This symbol indicates the marked equipment may contain a component that can eject forcibly. Obey all procedures to safely depressurize.		This symbol indicates safety boots must be worn.
	This symbol indicates the system is under pressure.		This symbol indicates the operator must read all available documentation to perform required procedures.
	This symbol indicates there is a potential UV hazard. Proper protection must be worn.		This symbol indicates the plumber must use copper piping.
	This symbol indicates the marked item could be hot and should not be touched without care.		This symbol indicates that the system should only be connected to a properly grounded, grounding-type controller receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI).
	This symbol indicates there is a potential for VERY hot water when flow is started.		

**Warning:** This product may contain chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

## 1.2 Safety Precautions:

<b>⚠ DANGER</b>	
 	<p>Failure to follow these instructions will result in serious injury or death.</p> <ul style="list-style-type: none"> <li>• <b>Electric Shock:</b> To avoid possible electric shock, special care should be taken since water is present near the electrical equipment. Unless a situation is encountered that is explicitly addressed by the provided maintenance and troubleshooting sections, DO NOT attempt repairs yourself, refer to an authorized service facility.</li> <li>• <b>GROUNDING:</b> This product must be grounded. If it should malfunction or breakdown, grounding provides a path of least resistance for electric current to reduce the risk of electrical shock. This system is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances. Improper connection of the equipment-grounding conductor can result in a risk of electrocution. Check with a qualified electrician or service personnel if you are in doubt as to whether the outlet is properly grounded. DO NOT modify the plug provided with this system – if it does not fit in the outlet, have a proper outlet installed by a qualified electrician. DO NOT use any type of adapter with this system.</li> <li>• <b>GROUND FAULT CIRCUIT INTERRUPTER PROTECTION:</b> To comply with the National Electrical Code (NFPA 70) and to provide additional protection from the risk of electric shock, this system should only be connected to a properly grounded, grounding-type controller receptacle that is protected by a Ground Fault Circuit Interrupter (GFCI) or to a residual current device (RCD) having a rated residual operating current not exceeding 30 mA. Inspect operation of GFCI as per manufacturer’s suggested maintenance schedule.</li> <li>• DO NOT operate the disinfection system if it has a damaged cord or plug, if it is malfunctioning or if it has been dropped or damaged in any manner.</li> <li>• DO NOT use this disinfection system for other than intended use (potable water applications). The use of attachments not recommended or sold by the manufacturer / distributor may cause an unsafe condition.</li> <li>• DO NOT install this disinfection system where it will be exposed to the weather or to temperatures below freezing.</li> <li>• DO NOT store this disinfection system where it will be exposed to the weather.</li> <li>• DO NOT store this disinfection system where it will be exposed to temperatures below freezing unless all water has been drained from it and the water supply has been disconnected.</li> </ul>

## Safety Information

### ⚠ WARNING



- During extended periods of no water flow, the water in your chamber can become very hot (Approx. 60 °C) and potentially lead to scalding. It is recommended to run your water until this hot water has been purged from your chamber. Do not allow water to contact your skin during this time. To eliminate this condition, a temperature management valve can be installed at the outlet of your UV system.
- Do not pass water through the UV system for a minimum of 5 minutes after applying power (including after power interruptions) to avoid passing under-treated water that may, in rare instances, pose health hazards.
- This system contains a UV Lamp. Do not operate the UV Lamp when it is removed from the chamber. Unintended use or damage of the system may result in the exposure of dangerous UV radiation. UV radiation may, even in little doses, cause harm to the eyes and skin.
- Changes or modifications made to this system without the consent of the manufacturer could render the system unsafe for operation and may void the manufacturer's warranty.

### ⚠ CAUTION



Failure to follow these instructions could result in minor or moderate injury.

- Double pole/Neutral fusing.
- Carefully examine the disinfection system after installation. It should not be plugged in if there is water on parts not intended to be wet such as, the controller or lamp connector.
- Due to thermal expansion concerns and potential material degradation due to UV exposure, it is recommended to use metal fittings and at least 10" of copper pipe on the outlet of your UV chamber.
- **Hg EXPOSURE:** The UV lamp contains mercury. If the lamp breaks, then avoid inhalation or ingestion of the debris and avoid exposure to eyes and skin. Never use a vacuum cleaner to clean up a broken lamp as this may scatter the spilled mercury. Obey local regulations and guidelines for the removal and disposal of mercury waste.

### NOTICE



- The UV lamp inside the disinfection system is rated at an effective life of approximately 18000 hours. To ensure continuous protection, replace the UV lamp once in two years.
- The UV system is not to be used or played with by children. Persons with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, are also not to handle the UV system unless they have been given supervision or instruction.
- This system is intended to be permanently connected to the water lines.
- This system is not intended to be used in or above water or outdoors or used in swimming pools when persons are in the pool.
- **EXTENSION CORDS:** If an extension cord is necessary, use only 3-wire extension cords that have 3-prong grounding-type plugs and 3-pole cord connectors that accept the plug from this system. Use only extension cords that are intended for outdoor use. Use only extension cords having an electrical rating not less than the rating of the system. A cord rated for less amperes or watts than this system rating may overheat. Exercise caution when arranging the cord so that it will not be tripped over or pulled. DO NOT use damaged extension cords. Examine extension cord before using and replace if damaged. DO NOT abuse extension cord. Keep extension cord away from heat and sharp edges. Always disconnect the extension cord from the receptacle before disconnecting this system from the extension cord. Never yank cord to pull plug from outlet. Always grasp the plug and pull to disconnect.
- If the supply cord is damaged, it must be replaced by a special cord or assembly available from the manufacturer or its service agent.
- **SYSTEM PROTECTION:** To protect your Controller, a UL1449 certified (or equivalent) transient voltage surge suppressor is strongly recommended.
- The UV lamp in this system conforms to the applicable provisions of the Code of Federal Regulations (CFR) requirements including, Title 21, Chapter 1, Subchapter J, Radiological Health.
- Read and understand the Owner's Manual before operating and performing any maintenance on this equipment.

## 1.3 Water Chemistry

Water quality is extremely important for the optimum performance of your UV system. The following levels are recommended for installation:

Water Quality and Minerals	Level
Iron	< 0.3 ppm (0.3 mg/L)
Hardness*	< 7 gpg (120 mg/L)
Turbidity	< 1 NTU
Manganese	< 0.05 ppm (0.05 mg/L)
Tannins	< 0.1 ppm (0.1 mg/L)
UV Transmittance	> 75% (call factory for recommendations on applications where UVT < 75%)

\* Where total hardness is less than 7 gpg, the UV unit should operate efficiently provided the quartz sleeve is cleaned periodically. If total hardness exceeds 7 gpg, the water should be softened. If your water chemistry contains levels in excess of those mentioned above, proper pre-treatment is recommended to correct these water problems prior to the installation of your UV disinfection system. These water quality parameters can be tested by your local dealer, or by most private analytical laboratories. *Proper pre-treatment is essential for the UV disinfection system to operate as intended.*

## Section 2 General Information

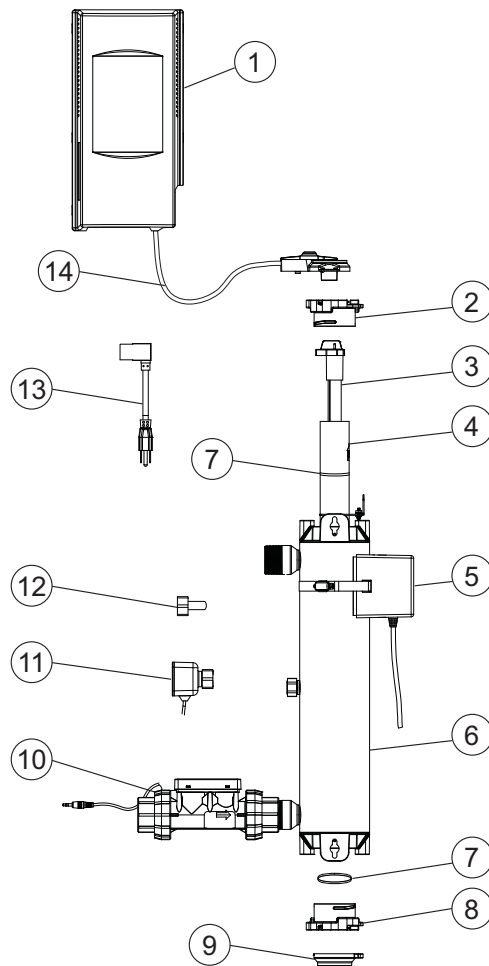


Figure 1 System Components

Item	Description	Part Number	UV Systems
1	Controller	650709-003	PRO10
		650709-006	PRO20
		650709-009	PRO30
		660020-R	PRO50
		650709-005	H+
		660019-R	K+
		650709-004	H
		660018-R	K
2	Top Bolt and Wireform	602916 & 602896	Used for all systems
3	Lamp	602854	PRO10
		602855	PRO20, H+, H
		602856	PRO30/50, K+, K
4	Sleeve	602974	PRO10
		602975	PRO20, H+, H
		602976	PRO30/50, K+, K
5	CoolTouch Fan	650630	Used for all systems
6	Chamber	-	Used for all systems
7	O-ring	002233	Used for all systems

## General Information

8	Bottom bolt (includes screw)	603053	Used for all systems
9	Sleeve Removal Tool	602988	Used for all systems
10	Flow Meter Sensor (PRO models only)	410982R-10	PRO10
		410982R-20	PRO20
		410982R-30	PRO30
11	Sensor	650580	PRO and Plus models
12	Plug	-	Basic models
13	Power cord	602636	110V - Used for all systems
		602637	220V - Used for all systems
14	Lamp cord	-	Used for all systems

## 2.1 Dimensions and Layout

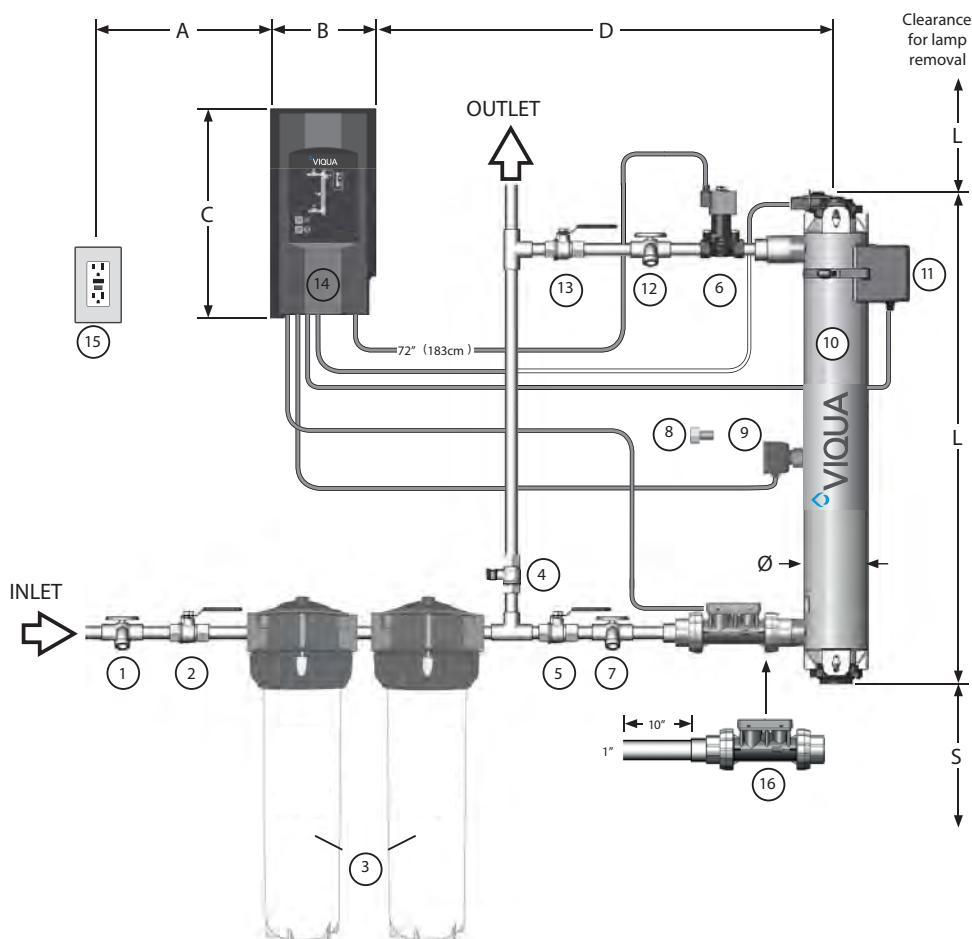


Figure 2 System - Dimension and Layout

Item	Description	Function
1	Sample Valve	Allows for sampling of raw water.
2	Shut-off Valve	Allows for ease of maintenance of pre-treatment equipment.
3	Pre-Treatment	Pre-treatment allows the UV system to operate effectively. The water should meet certain water quality parameters before entering UV System.
4	Bypass shut-off valve:	Bypass line and valve are optional. Intended to provide emergency water supply in the event that the UV system is unavailable.
5	Shut-off valve	Required to allow maintenance of UV system.

6	Solenoid valve	Allows water supply to be shut-off when proper disinfection cannot be assured. <b>Note:</b> If the ground from your electrical panel is tied to your copper water lines, and you are using a Plastic Body solenoid valve, installation of an approved ground strap is required. This ground strap will maintain continuity between the lines that have been cut to install the solenoid. Check your local electrical code for the correct clamp and cable size.
7	Sample valve	Allows for sampling of water entering UV chamber; necessary in order to confirm water being treated is of adequate quality.
8	Plug	A stopper provided and installed on Basic models.
9	Sensor	Monitors UV output to ensure proper dose (UV exposure) is being provided.
10	UV chamber	Provides disinfection of the water. <b>MUST BE INSTALLED VERTICALLY.</b>
11	CoolTouch™ fan	Removes excess heat from water in chamber during periods without water flow.
12	Sample valve	Allows for sampling of water immediately following UV treatment; necessary in order to confirm proper operation of UV system.
13	Shut-off valve	Allows maintenance of UV system.
14	Controller	Powers and controls the UV lamp and other devices. Provides human interface, displaying information and allowing control inputs (such as muting the audible alarm).
15	Power source	Provides power to the controller. For safety reasons the outlet must be protected by a Ground Fault Circuit Interrupter (GFCI). <b>Note:</b> To protect the controller, a UL1449 certified (or equivalent) transient voltage surge suppressor is required.
16	Flow Sensor	Monitors flow to provide real time dose (UV exposure) Flow Meter Sensor must be installed in this orientation with the LED facing up. (PRO10, PRO20, PRO30 only)

Item	L	S (minimum)	O	A (maximum)	B	C	D
PRO10	21.4" (55 cm)	12" (30 cm)	4" (10 cm)	72" (182 cm)	6.5" (16.5 cm)	13" (33 cm)	48" (122 cm)
PRO20, H+, H	31" (78 cm)	12" (30 cm)	4" (10 cm)	72" (182 cm)	6.5" (16.5 cm)	13" (33 cm)	48" (122 cm)
PRO30	41" (103 cm)	12" (30 cm)	4" (10 cm)	72" (182 cm)	6.5" (16.5 cm)	13" (33 cm)	48" (122 cm)
PRO50, K+, K	41" (103 cm)	12" (30 cm)	4" (10 cm)	72" (182 cm)	6.5" (16.5 cm)	13" (33 cm)	48" (122 cm)

## 2.2 Pipe Lengths

The recommended minimum straight pipe lengths for the various piping configurations are:



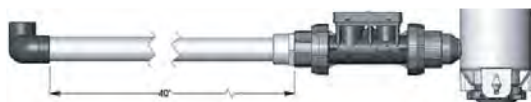
Straight Flange 10" straight pipe



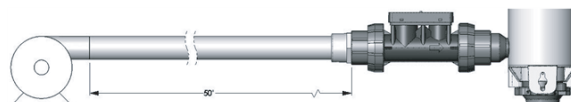
Reducing Flange 15" straight pipe



2 x 90 degree Elbows 25" straight pipe



2 x 90 degree Elbows 3 dimensions 40" straight pipe



Pump 50" straight pipe

**Note:** Flow Meter Sensor must be mounted in the following orientation with the LED facing up. Ensure all air is purged from the piping and Flow Meter Sensor. All straight length to the Flow Meter Sensor must be 1.00" in diameter.

## Section 3 Installation

### 3.1 Installing UV System

#### ⚠ CAUTION

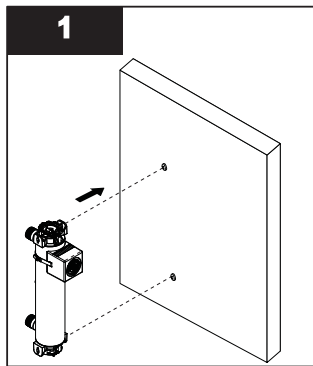


Electronic controller must be connected to a Ground Fault Protected Circuit (GFCI) receptacle.

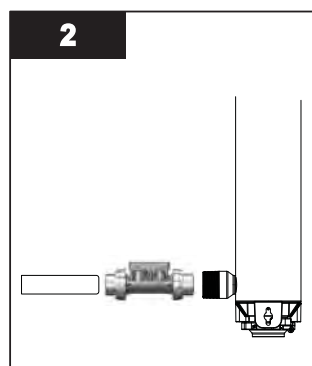
#### Prerequisites:

- Determine appropriate indoor location of the controller and chamber, refer to [Section 2.1](#).
- Make sure that the controller is installed higher than the chamber and away from all water sources.
- Ensure adequate clearance above chamber to allow for removal of the lamp and sleeve.
- Make sure to turn off the main water supply.
- Make all necessary plumbing connections refer to [Section 2.1](#).

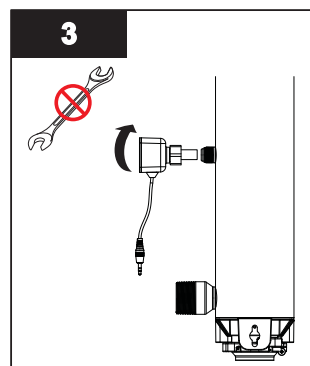
#### Procedure:



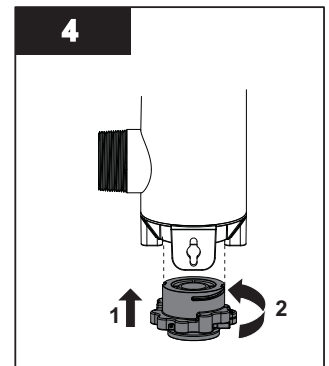
- Install the UV Chamber vertically with the following spacing on the wall using screws.
    - PRO10: 18.5"
    - H, PRO20: 27.5"
    - K, PRO30/50: 37.5"
- Note:** Ensure chamber is installed with green arrows pointing upwards.



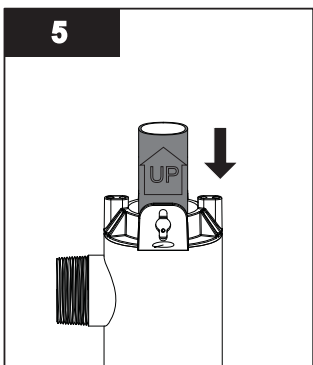
- Connect Flow Meter Sensor (PRO10,20,30 models only) to chamber using 1¼" unions supplied.
- Note:** LED must face up. Ensure proper length of straight pipe 1.0" Diameter at inlet side of Flow Meter Sensor and use a 1¼" to 1" Reducing Coupler (not supplied).



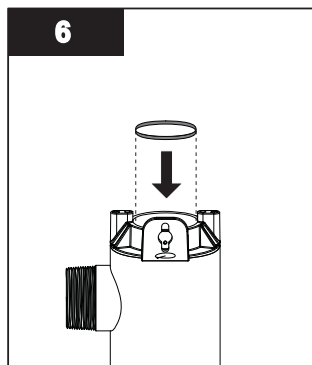
- Install the sensor to the UV system (for PRO models only).
- Note:** DO NOT use wrench to tighten the sensor.



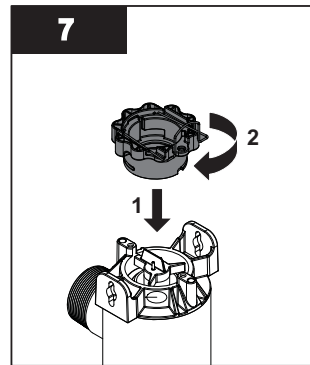
- Connect the sleeve bolt at the bottom of the sleeve assembly. Ensure sleeve bolt is rotated full 1/4 turn until positive stop.



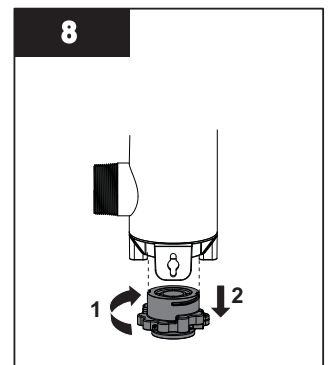
- Insert sleeve with arrow pointing up.
- Note:** DO NOT rotate sleeve and touch glass with bare hands.



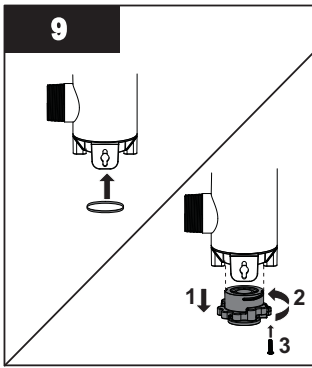
- Wet O-ring with water then place over top end of sleeve.



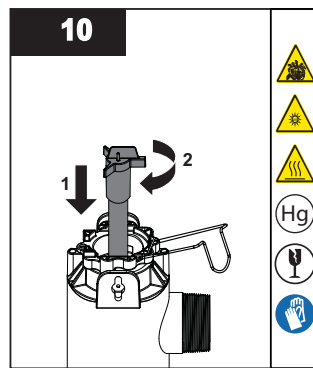
- Connect the sleeve bolt to the top of the sleeve assembly. Ensure sleeve bolt is rotated full 1/4 turn until positive stop.



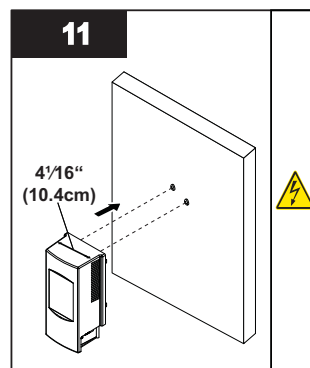
- Remove the sleeve bolt at the bottom of the sleeve assembly.



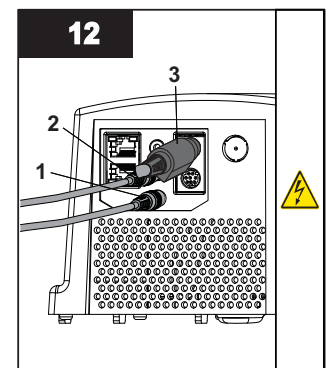
- Wet O-ring with water then place over bottom end of sleeve.
- Reconnect the sleeve bolt and install screw.



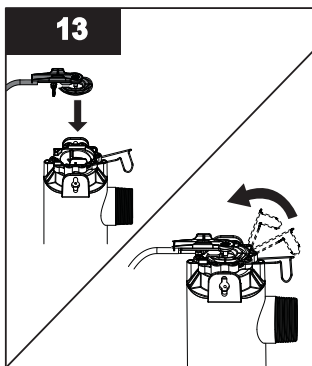
- Install and rotate the lamp into the sleeve assembly. Ensure to rotate the lamp completely.
- Note:** Do not touch glass with bare hands.



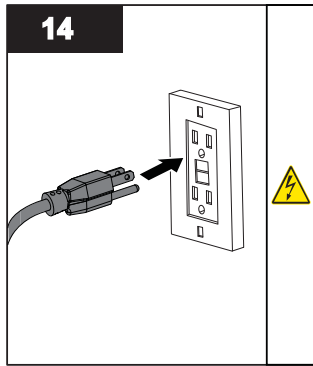
- Install the controller unit to the wall. Ensure that the controller is installed higher than the chamber and away from all water sources.



- Connect UV sensor into blue jack (For PRO and Plus models only).
- Connect Flow meter sensor into green jack (For PRO10, 20, 30 only).
- Connect CoolTouch™ fan into either receptacle.



- Install lamp harness onto chamber.
- Notes:** 1) Ensure lamp harness ground is inserted into chamber ground terminal.
- 2) Ensure magnet on top of chamber aligns with proximity sensor on lamp harness.
- Lock wire form into position.



- Connect controller to power outlet.
- Note:** Lamp ignition may take up to 25 seconds.
  - Allow water flow to one faucet or other water outlet, then close the outlet and inspect for leaks.

**Note:** Outlet must be protected by a Ground Fault Circuit Interrupter (GFCI).

**Note:** After installing the UV lamp or sleeve perform the disinfection procedure, refer to [Section 3.2](#).

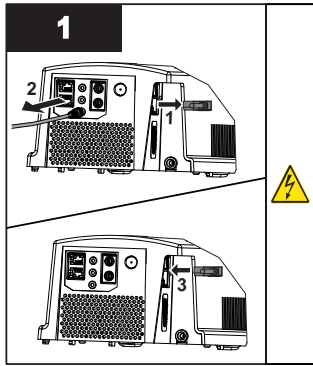
## 3.2 Disinfection Procedure

UV disinfection is a physical disinfection process and does not add any potentially harmful chemicals to the water. As UV does not provide a disinfection residual, it is imperative that the entire distribution system located after the UV be chemically disinfected to ensure that the plumbing system is free from any bacteriological contaminants. The disinfection process must be performed immediately after the UV unit is installed and repeated thereafter whenever the UV is shut down for service, without power, or inoperative for any reason. The procedure for sanitizing the plumbing system is readily accomplished as follows:

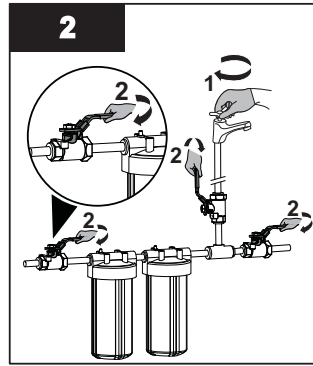


# Installation

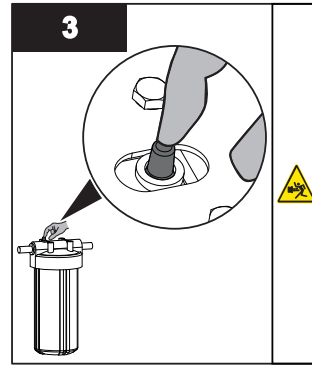
## Procedure:



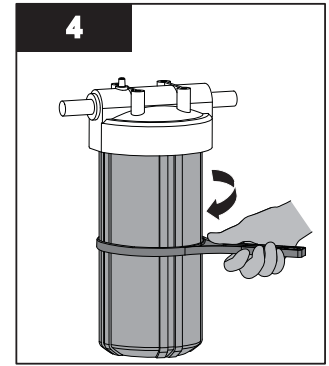
- Disconnect the controller then disconnect the UV sensor from blue jack.
- Reconnect the controller with out UV sensor.



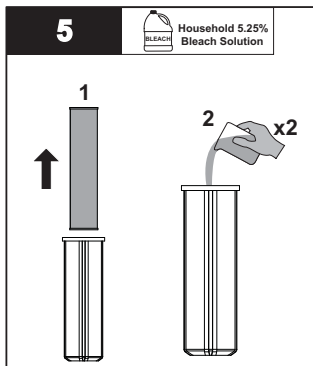
- Shut off the water supply.
- Open an upstream faucet to release line pressure



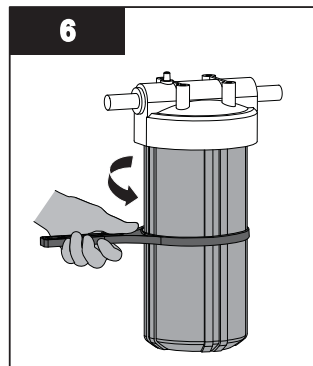
- Press the pressure button to release the pressure from the cartridges.



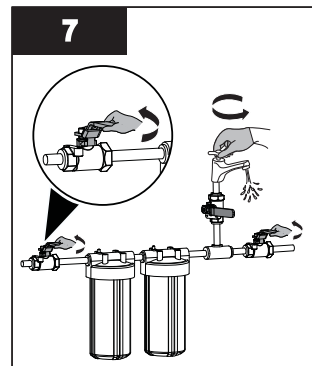
- Remove filter housing(s) using sump wrench.



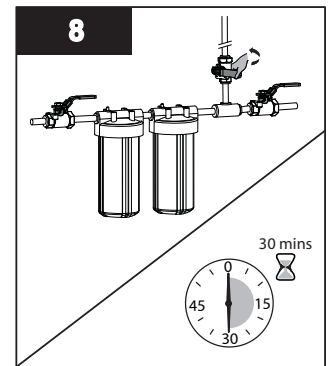
- Remove cartridge(s) and pour 2 cups of household bleach solution into the filter housing(s).
- Note:** DO NOT use Hydrogen Peroxide.



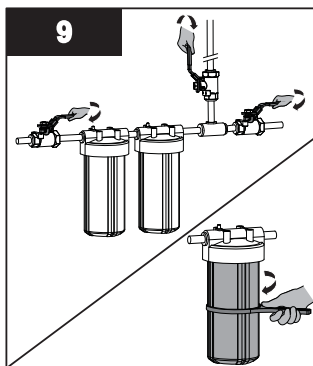
- Connect only the filter housing(s) to the unit.



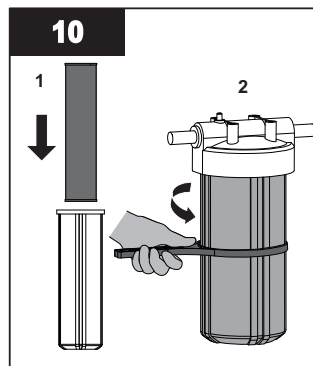
- Open each faucets and turn on water supply.
- Allow water to fill the chamber.



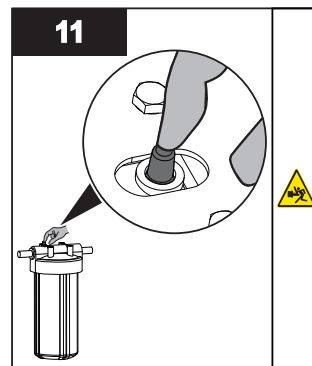
- Turn on the cold water supply followed by hot water (if available) until you smell the bleach.
- Close all faucets and allow bleach to settle in the water lines for 30 minutes.



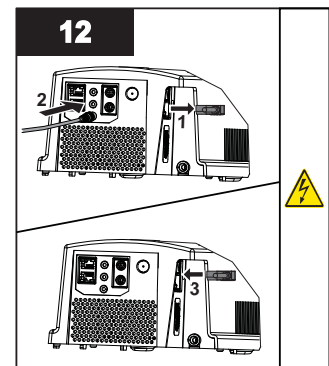
- With all faucets closed, remove filter housing(s) using sump wrench.



- Reinstall the cartridge(s) into filter housing(s) and connect to the unit.
- Flush all water outlets until bleach can no longer be smelled (at least 5 minutes).



- Press the pressure button to purge air and to complete the disinfection procedure.



- Disconnect the controller then connect the UV sensor from blue jack.
- Reconnect the controller.

## Section 4 Maintenance

### ⚠ WARNING



- Always disconnect power before performing any work on the disinfection system.
- Always shut-off water flow and release water pressure before servicing.
- Regularly inspect your disinfection system to ensure that the power indicators are on and no alarms are present.
- Replace the UV lamp biennially to ensure maximum disinfection.
- Always drain the chamber when closing a seasonal home or leaving the unit in an area subject to freezing temperatures.

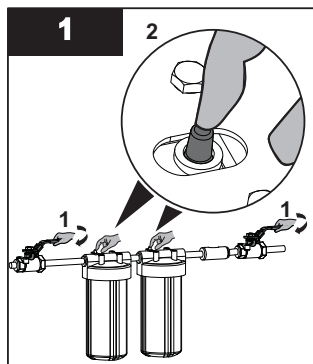
### 4.1 Replacing UV Lamp

### NOTICE

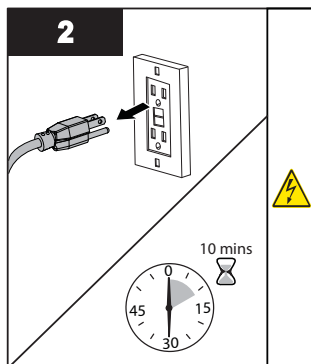
Do not use water during replacement of UV lamp.

UV lamp replacement is a quick and simple procedure requiring no special tools. The UV lamp must be replaced after 18000 hours of continuous operation (approximately two years) in order to ensure adequate disinfection.

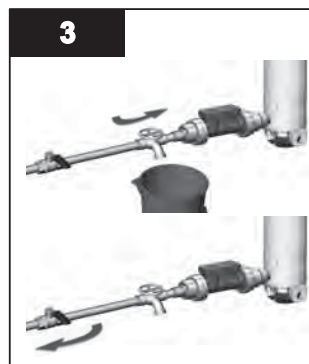
#### Procedure:



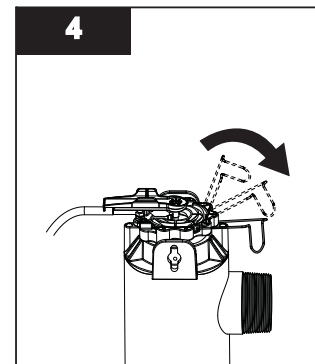
- Close all faucets and water supply.
- Press the pressure button to release the pressure from the cartridges.



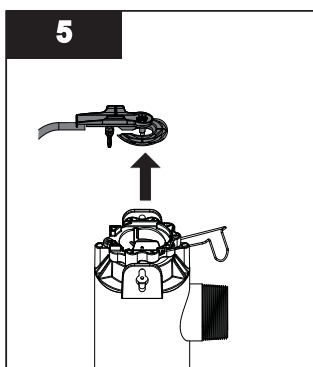
- Disconnect main power source and allow the unit to power down for 10 minutes.



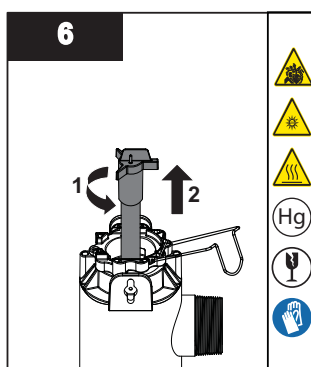
- Drain the water from the UV system.
- Close the water inlet after the water is drained.



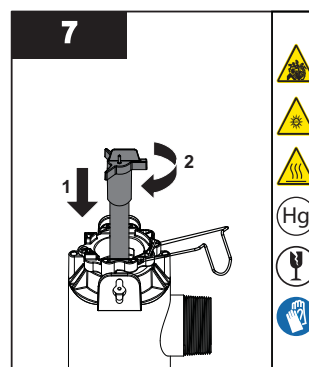
- Pinch wire form to release the lamp connector.



- Remove the lamp connector.

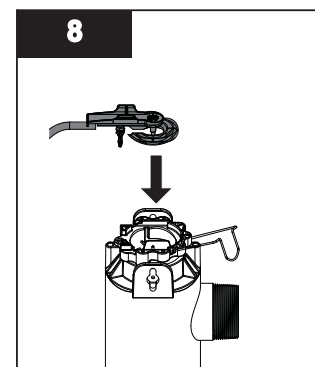


- Rotate and remove the UV lamp from the sleeve.

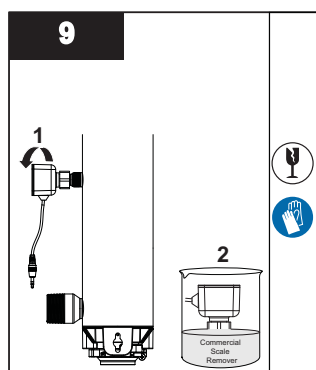


- Install and rotate the lamp into the sleeve assembly. Ensure to rotate the lamp completely.

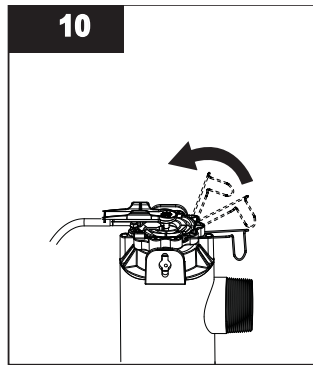
**Note:** Do not touch glass with bare hands.



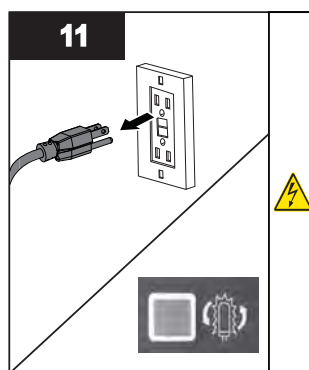
- Reinstall the lamp connector.



- Remove the UV sensor from the unit.
- Submerge the end of the sensor in the commercial scale remover for 30 minutes.
- Clean the sensor with a cotton swab and spray with water.
- For Basic model skip to step 10.

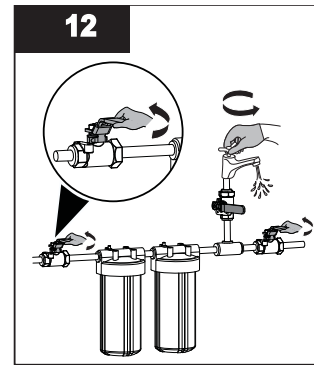


- Lock the wire form into position.



- Restore Power.
- Press and hold the “New Lamp” button for 5 seconds till you hear a beep.

**Note:** Lamp ignition may take up to 25 seconds.



- Turn on the water supply.

**Note:** After replacing the UV lamp perform the disinfection procedure, refer to [Section 3.2](#).

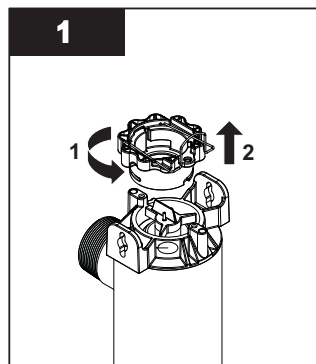
## 4.2 Cleaning and Replacing Sleeve

**Note:** Minerals in the water slowly form a coating on the lamp sleeve. This coating must be removed because it reduces the amount of UV light reaching the water, thereby reducing disinfection performance. If the sleeve can not be cleaned, it must be replaced.

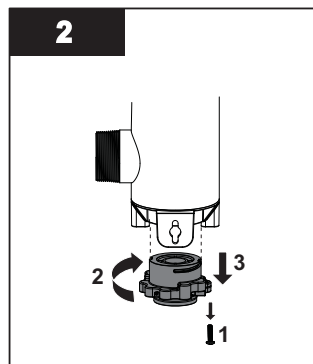
### Prerequisites:

- Shut off water supply and drain all lines.
- Remove the UV lamp. Refer to [Section 4.1](#).

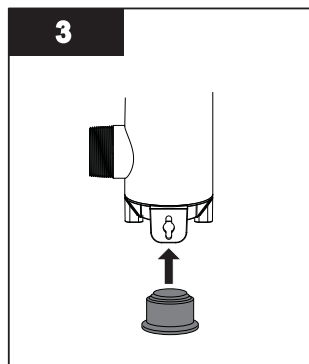
### Procedure:



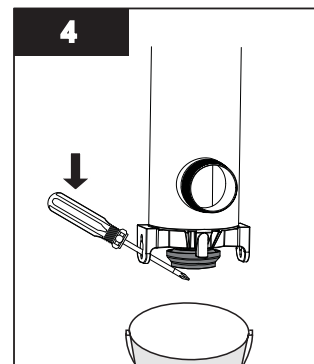
- Remove the sleeve bolt from top of the sleeve assembly.



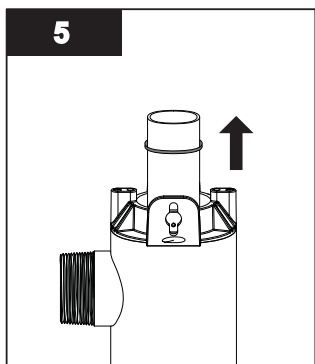
- Remove screw from the sleeve bolt.
- Remove the sleeve bolt at the bottom of the sleeve assembly.



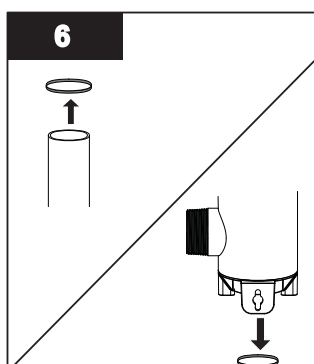
- Insert the sleeve removal tool into the bottom of the sleeve.



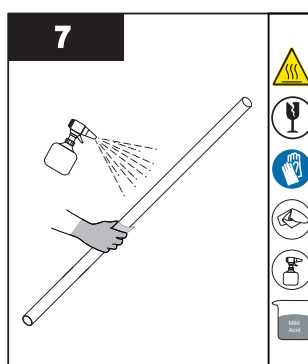
- Pry sleeve upward until it come loose.
- Place bucket under UV chamber, water will escape.



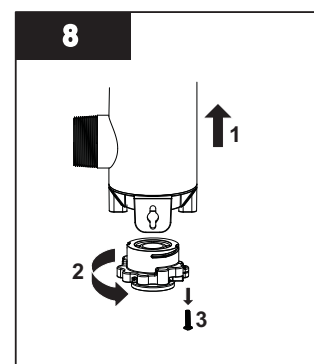
- Remove the sleeve.



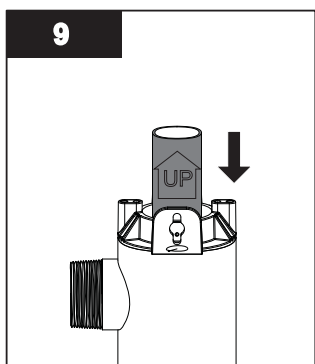
- Remove O-ring from top of the sleeve.
- Remove O-ring from bottom of the chamber (it may fall during sleeve removal process).



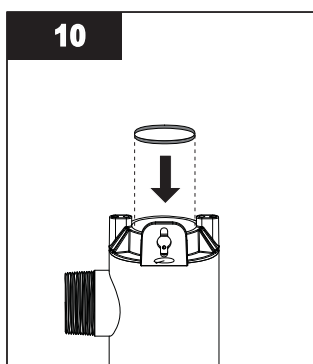
- Clean the sleeve with a cloth soaked in CLR, vinegar or some other mild acid and then rinse with water.
- Note:** If sleeve cannot be cleaned completely or it is scratched or cracked, then replace the sleeve.



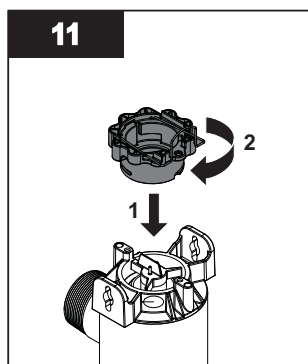
- Connect the sleeve bolt at the bottom of the sleeve assembly.



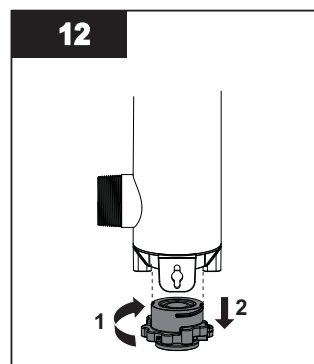
- Reinstall the sleeve with arrow pointing up.
- Note:** DO NOT rotate sleeve and touch glass with bare hands.



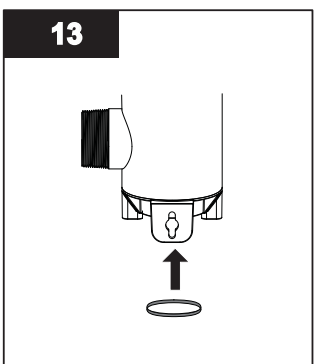
- Reinstall the new lubricated O-rings over the top end of the sleeve.



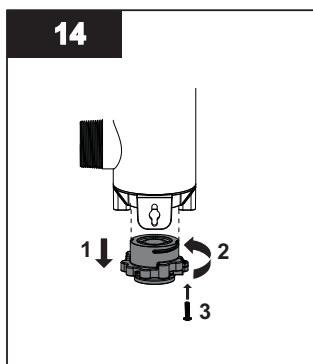
- Connect the sleeve bolt to the top of the sleeve assembly.



- Remove the sleeve bolt at the bottom of the sleeve assembly.



- Reinstall the O-ring at the bottom of the sleeve.



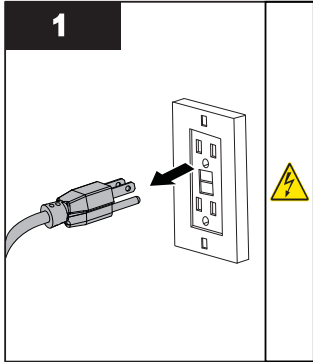
- Connect the sleeve bolt at the bottom.
- When service is complete, assemble the prerequisites in the reverse order of disassembly.

**Note:** After replacing the UV lamp or sleeve perform the disinfection procedure, refer to [Section 3.2](#).

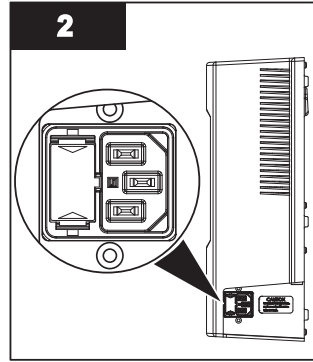
### 4.3 Fuse Replacement

The system comes equipped with two functioning 250V 3A fuses. To access the fuses, first unplug system and disconnect the power cord from the controller. Remove the fuse door by pushing in the tab on one side using a knife or other tool and gently prying outwards. Repeat on the other side.

#### Procedure:



- Disconnect the controller to the system.



- Replace the fuse.

**Caution:** Double pole/Neutral fusing

### 4.4 Flow Meter Sensor Maintenance

Inspect Flow Meter Sensor periodically to ensure that there is no fouling and the paddle wheel spins freely with no resistance.

If paddle wheel does not spin freely or is loose the sensor should be returned for service and calibration. It is recommended that the Flow Meter Sensor be returned for calibration every two years to ensure accurate system operation.

# Section 5 Operation

## 5.1 Control Panel

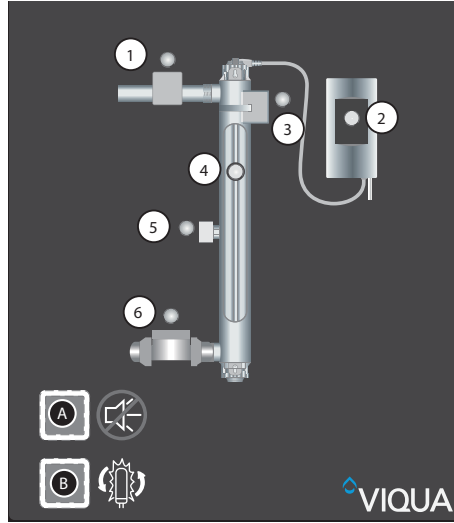


Figure 3 Control Panel

Buttons and Display				
Feature	Description	Function		
A	Mute	Press to silence audible alarm. When the alarm is due to the lamp's age, the mute button will silence the audible alarm for 7 days; this may be repeated up to a maximum of 4 times. After that, the button will silence for only 24 hours. When the alarm is due to any other issue, the mute button will silence the audible alarm for 24 hours.		
B	New Lamp	After installing a new lamp, press and hold for five seconds to reset Lamp timer.		
Indicator Lights				
LED	Green	Yellow	Flashing red	Solid red
1	Solenoid valve open (If equipped with solenoid)	Not applicable	Solenoid valve disconnected; reconnect. Solenoid coil damaged; replace coil (not entire solenoid).	Solenoid valve inactive (closed) due to failure of another component, in order to ensure safety of the water supply.
2	Operating normally <b>Note:</b> For Pro 10, 20, 30 Models, indicator will be flashing when system is in power savings mode.	Not applicable	Lamp connector not installed properly. Ensure lamp harness ground is inserted into chamber ground terminal. Controller failure, replace controller.	Lamp inactive due to controller failure.
3	Operating normally	Not applicable	Fan disconnected, reconnect. Fan turning slower than required; unplug system, clean blades using a Q-tip. Fan damaged, replace fan.	Not applicable.
4	Operating normally <b>Note:</b> During the lamp warm up, the indicator will flash	Warning: Lamp will require replacement shortly	Lamp disconnected; remove power, reconnect lamp and connect the controller. Lamp failure, replace lamp.	Lamp inactive due to controller failure. End of lamp reset required. Refer to Feature B in the above table.
5	UV dose is adequate and sensor is operating normally (For Plus Models only)	UV dose is near the minimum required	Sensor disconnected; unplug system, reconnect sensor and plug-in system again. Sensor failure. UV dose is below minimum required, see Low UV Alarm section.	Sensor inactive due to lamp or controller failure.
6*	Flow Meter operating normally	High flow UV dose inadequate, reduce flow to achieve higher dose levels	Flow meter sensor failure; service or replace sensor.	Low flow UV dose inadequate, service required.

\* PRO10, PRO20, and PRO30 only

# Section 6 Troubleshooting

Symptom	Possible Cause	Possible Solution
No power	GFCI and/or breaker tripped	Reset GFCI and/or breaker
	Controller fuse has blown	Replace controller fuse - see Fuse Replacement section (Refer <a href="#">Section 4.3</a> ).
	Transient voltage surge suppressor (TVSS) damaged	Replace TVSS
	Controller damaged	Replace controller and use a TVSS
GFCI or breaker repeatedly trips	Connection between lamp and lamp plug is wet	Clean and dry lamp pins and lamp plug, check unit for leaks or condensation
	Short-circuit in the electrical assembly	Replace controller
Leak at inlet or outlet	Threaded pipe fittings are leaking	Clean threads, reseal with Teflon tape and retighten
Leak detected from area of UV chamber	Condensation of moist air on cold chamber (slow accumulation)	Control humidity or relocate unit
	O-ring damaged, deteriorated or incorrectly installed	Inspect and replace if deteriorated
	Lamp/sleeve assembly not properly installed (too tight or not tight enough)	Ensure nut is turned completely
Alarm	Refer to <a href="#">Section 5.1</a> .	Refer to <a href="#">Section 5.1</a> .
System is operating but water tests reveal bacterial contamination	Equipment downstream of UV system is acting as a breeding ground for pathogens	Ensure UV is the last piece of treatment equipment
	Pathogens are residing in the distribution lines post-UV	Ensure all distribution lines have been disinfected with chlorine. Refer to <a href="#">Section 3.2</a> .
	Recontamination from pipe dead-ends	Remove any pipe dead-ends and flush with chlorine. Refer to <a href="#">Section 3.2</a> .
Flow Meter Sensor red status LED	Detect Flow Sensor not detecting flow	Increase Flow rate through meter
	Flow Meter Sensor not functioning	Flow Meter requires maintenance or replacement

## 6.1 LOW UV ALARMS (PRO and Plus Series Only)

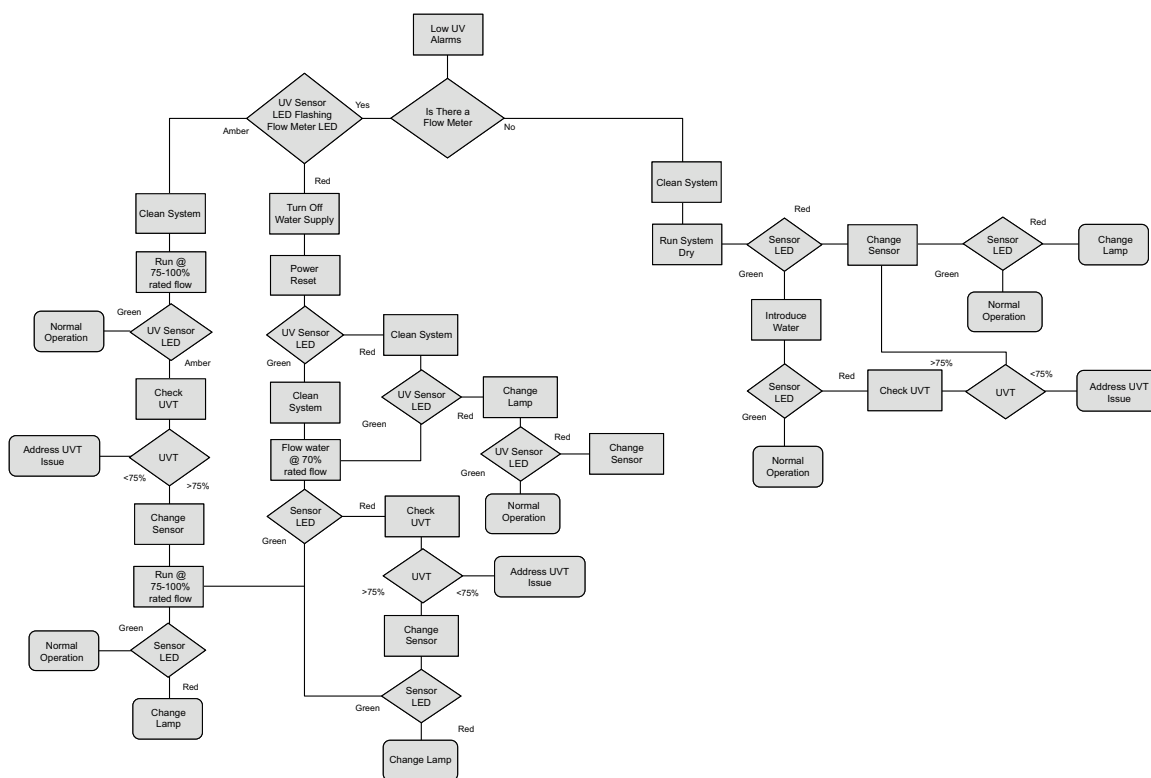


Figure 4 Low UV Alarms (PRO and Plus Series Only)

1. In some cases, short-term flows of low ultraviolet transmittance (UVT) water can be created following and during the regeneration cycle of a water softener, resulting in a sensor alarm. Flushing the UV system alleviates this condition until the softener goes through another regeneration cycle. In the longer term, the softener's settings must be modified. To flush the UV system, unplug the sensor, then open a tap downstream and let water run for two (2) minutes. Disinfect the water lines following the procedures outlined under "Disinfecting The Water Lines" in the Installation section.
2. Refer to Sleeve Cleaning And Lamp Replacement section of the Owner's Manual.
3. Contact your water treatment dealer to inquire about testing the UVT of your water.





## Section 7 Specifications

<b>General (All Models)</b>	
<b>Operating Parameters</b>	
Maximum operating pressure	125 PSI (861 kPa)
Minimum operating pressure	15 PSI (103 kPa)
Maximum ambient air temperature	104 °F (40 °C)
Minimum ambient air temperature	32 °F (0 °C)
Maximum humidity	100%
Maximum hardness	120 ppm (7 grains per gallon)
Maximum iron	0.3 ppm
Minimum UVT	75%*
Installation	Vertical ONLY
<b>Others</b>	
Chamber material	316L SST
Rated service life of lamp	up to 2 years
* PRO50 has a minimum UVT rating of 85%	

	<b>PRO10</b>	<b>PRO20</b>	<b>PRO30</b>	<b>PRO50</b>	<b>H, H+</b>	<b>K, K+</b>
Rated flow for NSF Std 55, Class A	10 gpm (38 lpm) (2.2 m <sup>3</sup> /hr)	20 gpm (76 lpm) (4.5 m <sup>3</sup> /hr)	30 gpm (113 lpm) (6.8 m <sup>3</sup> /hr)	-	-	-
Rated flow dose of 30 mJ/cm <sup>2</sup> @ 95% UVT	-	-	-	-	45 gpm (170 lpm) (10 m <sup>3</sup> /hr)	80 gpm (303 lpm) (18 m <sup>3</sup> /hr)
Rated flow dose of 40 mJ/cm <sup>2</sup> @ 95% UVT	-	-	-	-	37 gpm (140 lpm) (8.4 m <sup>3</sup> /hr)	60 gpm (226 lpm) (13.6 m <sup>3</sup> /hr)
Rated flow for USEPA UVDGM 2006 protocol	-	-	-	50 gpm (189 lpm) (11.3 m <sup>3</sup> /hr)	-	-
<b>Electrical</b>						
Voltage	100-240V 50/60Hz	100-240V 50/60Hz	100-240V 50/60Hz	100-240V 50/60Hz	100-240V 50/60Hz	100-240V 50/60Hz
Max. current	2.5 Amp	2.5 Amp	2.5 Amp	2.5 Amp	2.5 Amp	2.5 Amp
Max. power consumption	120 Watts	160 Watts	230 Watts	230 Watts	160 Watts	230 Watts
Lamp power consumption	100 Watts	140 Watts	200 Watts	200 Watts	140 Watts	200 Watts
<b>Port Size</b>						
Inlet and outlet	Combo 1½" NPT, 1" FNPT	Combo 1½" NPT, 1" FNPT	Combo 1½" NPT, 1" FNPT	2" MNPT	Combo 1½" NPT, 1" FNPT	2" MNPT



## Specifications

	PRO Series	Plus Series	Basic Series
Sensor	Yes	Yes	No
CoolTouch fan	Yes	Yes	Yes
Dynamic flow restrictor (PRO10, 20, 30 models only)	Yes	No	No
Communications ports (two, RJ45)	Yes	Yes	Yes
COMMcenter control package	Optional	Optional	Optional
Solenoid valve	Optional	Optional	Optional
Flow Meter Sensor (PRO10, 20, 30 Models only)	Yes	No	No
<b>Controls</b>			
Audible alarm mute button	Yes	Yes	Yes
New lamp button	Yes	Yes	Yes
Lamp age indicator	Yes	Yes	Yes
Lamp operation indicator	Yes	Yes	Yes
Controller operation indicator	Yes	Yes	Yes
Solenoid operation indicator	Yes	Yes	Yes
Fan operation indicator	Yes	Yes	Yes
Sensor reading indicator	Yes	Yes	No
<b>NSF/ANSI certification</b> (PRO10, 20, 30 models only)	 Standard 55 Class A	No	No
<b>USEPA UVDGM 2006</b> (PRO50 model only)	Yes	No	No
<b>Other Certifications</b>			

## Section 8 Manufacturer's Warranty

### Our Commitment

VIQUA is committed to ensuring your experience with our products and organization exceeds your expectations. We have manufactured your UV disinfection system to the highest quality standards and value you as our customer. Should you need any support, or have questions about your system, please contact our Technical Support team at 1.800.265.7246 or [technicalsupport@viqua.com](mailto:technicalsupport@viqua.com) and we will be happy to assist you. We sincerely hope you enjoy the benefits of clean, safe drinking water after the installation of your VIQUA disinfection system.

### How to Make a Warranty Claim

**Note:** *To maximise the disinfection performance and reliability of your VIQUA product, the system must be properly sized, installed and maintained. Guidance on the necessary water quality parameters and maintenance requirements can be found in your Owner's Manual.*

In the event that repair or replacement of parts covered by this warranty are required, the process will be handled by your dealer. If you are unsure whether an equipment problem or failure is covered by warranty, contact our Technical Support team at 1.800.265.7246 or e-mail [technicalsupport@viqua.com](mailto:technicalsupport@viqua.com). Our fully trained technicians will help you troubleshoot the problem and identify a solution. Please have available the model number (system type), the date of purchase, the name of the dealer from whom you purchased your VIQUA product ("the source dealer"), as well as a description of the problem you are experiencing. To establish proof of purchase when making a warranty claim, you will either need your original invoice, or have previously completed and returned your product registration card via mail or online.

### Specific Warranty Coverage

Warranty coverage is specific to the VIQUA range of products. Warranty coverage is subject to the conditions and limitations outlined under "[General Conditions and Limitations](#)".

#### Ten-Year Limited Warranty for VIQUA UV Chamber

VIQUA warrants the UV chamber on the VIQUA product to be free from defects in material and workmanship for a period of ten (10) years from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective VIQUA UV chamber. Please return the defective part to your dealer who will process your claim.

#### Five-Year Limited Warranty for Electrical and Hardware Components

VIQUA warrants the electrical (controller) and hardware components to be free from defects in material and workmanship for a period of five (5) years from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective parts covered by the warranty. Please return the defective part to your dealer who will process your claim.

#### One-Year Limited Warranty for UV lamps, Sleeves, and UV Sensors

VIQUA warrants UV lamps, sleeves, and UV Sensors to be free from defects in material and workmanship for a period of one (1) year from the date of purchase. During this time, VIQUA will repair or replace, at its option, any defective parts covered by the warranty. Your dealer will process your claim and advise whether the defective item needs to be returned for failure analysis.

**Note:** *Use only genuine VIQUA replacement lamps and sleeves in your system. Failure to do so may seriously compromise disinfection performance and affect warranty coverage.*

### General Conditions and Limitations

None of the above warranties cover damage caused by improper use or maintenance, accidents, acts of God or minor scratches or imperfections that do not materially impair the operation of the product. The warranties also do not cover products that are not installed as outlined in the applicable Owner's Manual.

Parts repaired or replaced under these warranties will be covered under warranty up to the end of the warranty period applicable to the original part.

The above warranties do not include the cost of shipping and handling of returned items. The limited warranties described above are the only warranties applicable to the VIQUA range of products. These limited warranties outline the exclusive remedy for all claims based on a failure of or defect in any of these products, whether the claim is based on contract, tort (including negligence), strict liability or otherwise. These warranties are in lieu of all other warranties whether written, oral, implied or statutory. Without limitation, no warranty of merchantability or of fitness for a particular purpose shall apply to any of these products.

VIQUA does not assume any liability for personal injury or property damage caused by the use or misuse of any of the above products. VIQUA shall not in any event be liable for special, incidental, indirect or consequential damages. VIQUA's liability shall, in all instances, be limited to repair or replacement of the defective product or part and this liability will terminate upon expiration of the applicable warranty period.



425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1  
t. (+1) 519.763.1032 • tf. (+1) 800.265.7246 (US and Canada only)  
t. (+31) 73 747 0144 (Europe only) • f. (+1) 519.763.5069  
e-mail: [info@viqua.com](mailto:info@viqua.com)  
[www.viqua.com](http://www.viqua.com)

# Flow Meter

# FM100, 1", Flow Meter

## Ultrasonic, Transit Time Technology



Technical Data	
Service	chilled, hot water, up to 60% glycol
Size [mm]	1" [25]
End Fitting	inlet 1" [25] npt female, outlet 1" [25] npt male
Body Pressure Rating [psi]	360
Inlet Length to Meet Specified Measurement Accuracy	inlet: 5x nominal pipe size (NPS) outlet: no requirement
Flow Measurement Tolerance	±2% *
Flow Measurement Repeatability	±0.5%
Sensor Technology	ultrasonic (transit time) with glycol and temperature compensation
Cv	20
Power Supply	24 VAC ± 20%, 24 VDC -10% + 20%
Power Consumption Rating	0.5 W / 1 VA
GPM Range	0.22-21.8...(1.0")
Media Temperature Range	-4°F to 250°F [-20°C to 120°C]
Output Signal	0-10 VDC
Output Resolution	1.25 mV
Wiring	black (ground), red (24 VAC/DC), white (VDC feedback signal)
Flow Housing Material	forged brass, nickel plated
Enclosure	NEMA 2, IP54, UL enclosure type 2
Electrical Connection	3ft [1m], 18 GA appliance cable
Quality Standard	ISO 9001
Velocity Range	0.10-9.20 FPS
Pressure loss at V'nom	1.18 psi

\*All flow accuracies are @ 68°F-77°F (20°C-25°C).

### Wiring Diagrams

#### ⚡ INSTALLATION NOTES

⚠ Provide overload protection and disconnect as required.

#### ⚠ WARNING! LIVE ELECTRICAL COMPONENTS!

During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

### Application

The ultrasonic flow meters are designed for HVAC chilled water, hot water, and water/glycol solutions from -4°F to 250°F [-20°C to 120°C] up to 60% glycol.

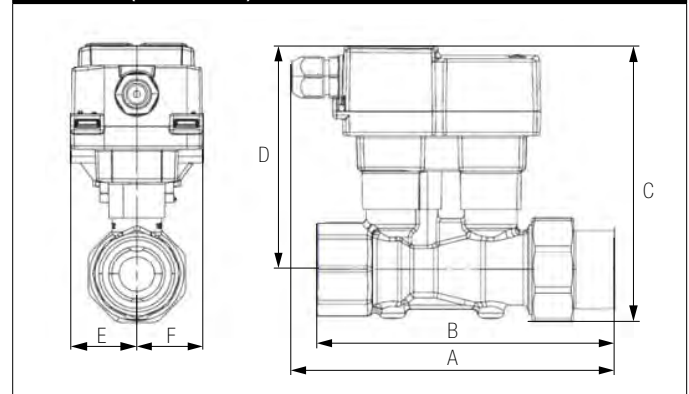
### Operation

The ultrasonic flow meter is an accurate and repeatable liquid flow measurement meter by utilizing ultrasonic transit time technology. The transducers perform as both emitter and receiver to provide accurate signal reflection.

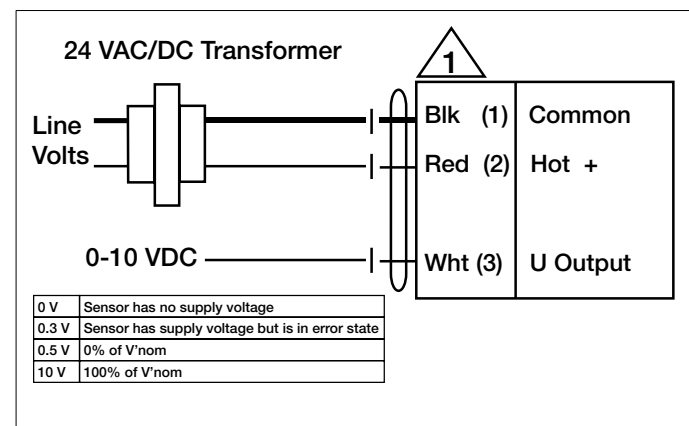
### Product Features

The flow meter incorporates an embedded temperature sensor which enables Belimo's patented temperature and glycol compensation logic to accurately read flow over a wide range of water variables. Easy installation and compact to fit anywhere.

### Dimensions (Inches [mm])



A	B	C	D	E	F
5.37"	4.88"	5.25"	4.45" [113]	1.5" [38]	
[136.4]	[124.0]	[133.4]			



# Flow Meters

## Ultrasonic Meters

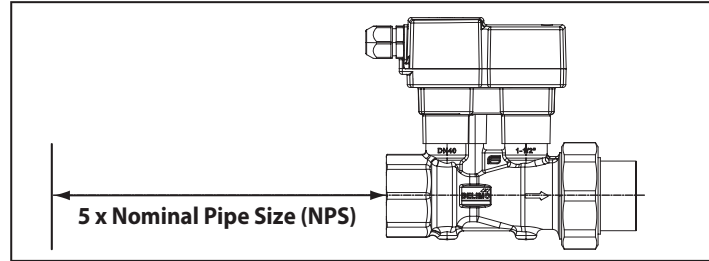


### INSTALLATION

#### Inlet Length

The Flow Meter requires a section of straight pipe on the sensor housing inlet to guarantee sensor accuracy. This section should be at least 5 pipe diameters long with respect to the size of the Flow Meter.

- 1/2" [DN15] 5 x nominal pipe size = 2.5" [64 mm]
- 3/4" [DN20] 5 x nominal pipe size = 3.75" [95 mm]
- 1" [DN25] 5 x nominal pipe size = 5" [127 mm]
- 1 1/4" [DN32] 5 x nominal pipe size = 6.25" [159 mm]
- 1 1/2" [DN40] 5 x nominal pipe size = 7.5" [191 mm]
- 2" [DN50] 5 x nominal pipe size = 10" [254 mm]

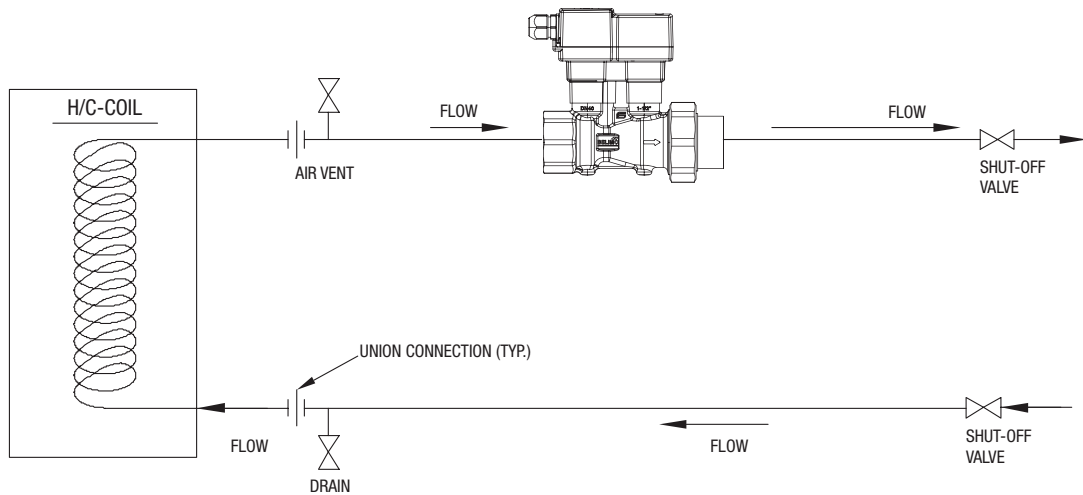


#### Outlet Length

No requirements for outlet length.  
Elbows can be installed directly after the valve.

### PIPING

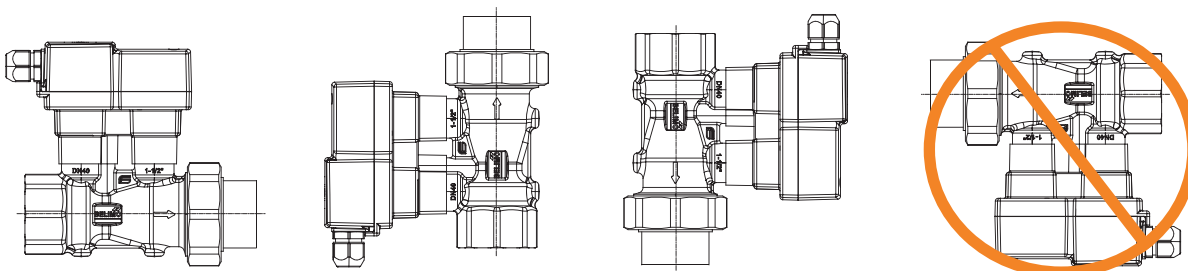
The Flow Meter is suitable for volumetric flow measurement of chilled or hot water in closed loop systems. If the Flow Meter will be installed to measure flow through a heat exchange device, it is recommended to be installed on the return side of the heat exchange device.



### ORIENTATION

Flow Meter shall be installed with flow in the direction of the arrow on the sensor housing.

The Flow Meter can be installed in a vertical or horizontal arrangement, as long as the sensor is positioned to avoid condensation from dripping onto the flow sensor.



# Motorized Ball Valve

# B225, 2-Way, Characterized Control Valve

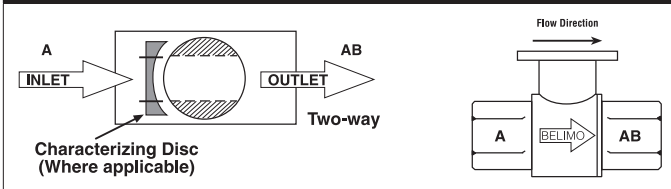
## Stainless Steel Ball and Stem



### Technical Data

Service	chilled, hot water, up to 60% glycol
Flow Characteristic	equal percentage
Controllable Flow Range	75°
Size [mm]	1" [25]
End Fitting	NPT female ends
Body	forged brass, nickel plated
Ball	stainless steel
Stem	stainless steel
Stem Packing	EPDM (lubricated)
Seat	Teflon® PTFE
Seat O-ring	EPDM (lubricated)
Characterized Disc	No Disc (full flow)
Body Pressure Rating [psi]	600
Media Temperature Range (Water)	0°F to 250°F [-18°C to 120°C]
Max Differential Pressure (Water)	50 psi (345 kPa)
Close-Off Pressure	200 psi
Cv	30
Weight	1.1 lb [0.5 kg]
Leakage	0% for A to AB
Servicing	maintenance free

### Flow Pattern



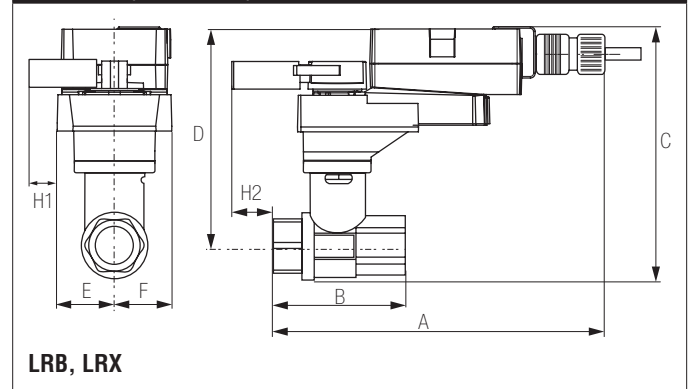
### Application

This valve is typically used in air handling units on heating or cooling coils, and fan coil unit heating or cooling coils. Some other common applications include Unit Ventilators, VAV box re-heat coils and bypass loops. This valve is suitable for use in a hydronic system with variable flow.

### Suitable Actuators

	Non-Spring	Spring
B225	LR, NR	LF

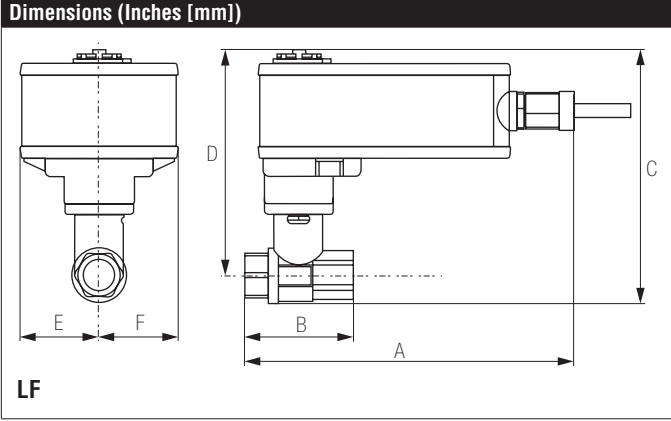
### Dimensions (Inches [mm])



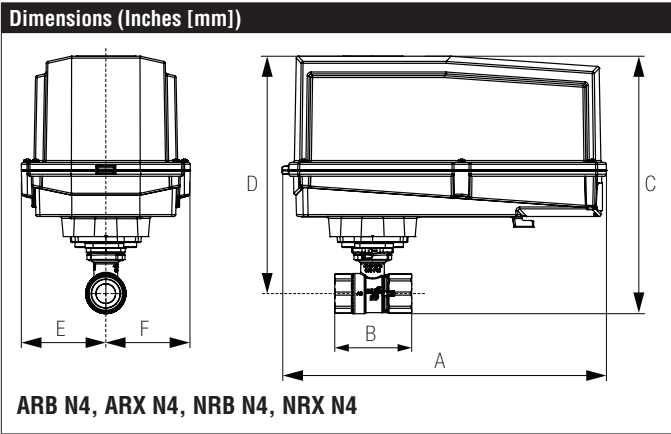
A	B	C	D	E	F	H1	H2
9.4" [239]	3.07" [78]	7.25" [184]	6.31" [160]	1.3" [33]		1.18" [30]	0.9" [23]

Date created, 10/07/2016 - Subject to change. © Belimo Aircontrols (USA), Inc.





A	B	C	D	E	F
8.12" [206]	3.07" [78]	6.5" [165]	5.57" [141]	1.82" [46]	



A	B	C	D	E	F
11.36" [289]	3.07" [78]	7.85" [199]	7.15" [181]	2.44" [62]	

# LF120 US, Valve Actuator

On/Off, Spring Return Fail-Safe, 120 VAC







Technical Data	
Power Supply	120 VAC $\pm$ 10%, 50/60 Hz
Power Consumption Running	5.5 W
Power Consumption Holding	3.5 W
Transformer Sizing	7.5 VA
Electrical Connection	3ft [1m], 18 GA appliance cable with 1/2" conduit connector
Overload Protection	electronic throughout 0° to 95° rotation
Operating Range Y	on/off
Angle of Rotation	90°
Direction of Rotation (Motor)	reversible with built-in switch
Direction of Rotation (Fail-Safe)	reversible with CW/CCW mounting
Position Indication	visual indicator, 0° to 95° (0° is full spring return position)
Running Time (Motor)	<40 to 75 sec
Running Time (Fail-Safe)	<25 sec @ -4°F to 122°F [-20°C to 50°C], < 60 sec @ -22°F [-30°C]
Ambient Temperature Range	-22°F to 122°F [-30°C to 50°C]
Storage Temperature Range	-40°F to 176°F [-40°C to 80°C]
Housing	NEMA 2, IP54
Agency Listings†	cULus acc. To UL 873 and CAN/CSA C22.2 No. 24-93
Noise Level (Motor)	<50 dB (A)
Noise Level (Fail-Safe)	<62 dB (A)
Servicing	maintenance free
Quality Standard	ISO 9001


†Rated Impulse Voltage 800V, Type of action 1.AA, Control Pollution Degree 3

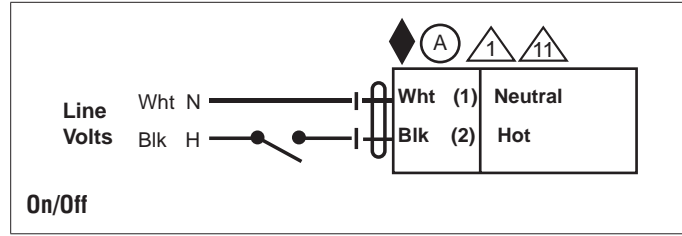
Date created, 08/16/2017 - Subject to change. © Belimo Aircontrols (USA), Inc.

**Wiring Diagrams**

**✂ INSTALLATION NOTES**

-  Actuators with appliance cables are numbered.
-  Provide overload protection and disconnect as required.
-  Actuators may be connected in parallel if not mechanically linked. Power consumption and input impedance must be observed.
-  Meets cULus requirements without the need of an electrical ground connection.

** WARNING! LIVE ELECTRICAL COMPONENTS!**  
 During installation, testing, servicing and troubleshooting of this product, it may be necessary to work with live electrical components. Have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks. Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.



# Characterized Control Valves (CCV)

## B2 (B) Series Characterized Control Valves

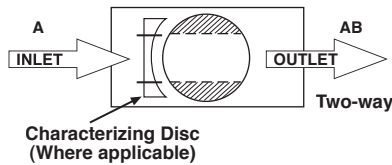
Two-way Valve with Stainless Steel Ball and Stem, Chrome Plated Brass Ball and Stem (B) 1/2" and 3/4" NPT female ends

### Technical Data

Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage
Media temp range	0°F to 250°F [-18°C to 120°C] (½" to 2") 0°F to 212°F [-18°C to 100°C] (2½" to 3")
Maximum differential pressure ( $\Delta P$ )	for characterized A-port 50 psi max (½" to 2") 30 psi max (2½" to 3")
Leakage	0% for A to AB

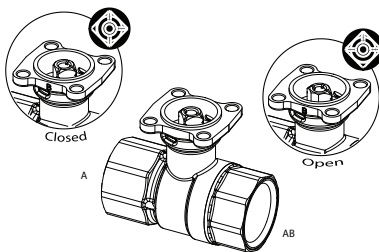
### Flow Pattern

#### Two-way Characterized Control Valves™ (Belimo B2 (B) Series)



\*Two-way valves should be installed with the disc upstream.

Valve should be installed with the disc upstream. If installed with disc downstream, Cv will be 5% reduced and flow curve will be deeper. If installed "backwards" it is NOT necessary to remove and change. No damage or control problems will occur.



## B3 (B) Series Characterized Control Valves

Three-way Valve with Stainless Steel Ball and Stem, Chrome Plated Brass Ball and Stem (B) 1/2" and 3/4" NPT female ends

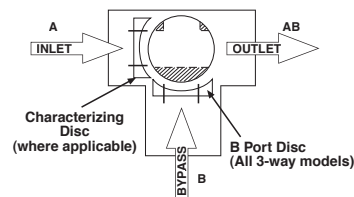
### Technical Data

Service	chilled or hot water, 60% glycol
Flow characteristic	A-port equal percentage B-port modified linear for constant flow
Media temp range	0°F to 250°F [-18°C to 120°C]
Maximum differential pressure ( $\Delta P$ )	for characterized A-port 50 psi max
Leakage	0% for A to AB, <2.0% for B to AB

### Flow Pattern

#### Three-way Characterized Control Valves™ (Belimo B3 (B) Series)

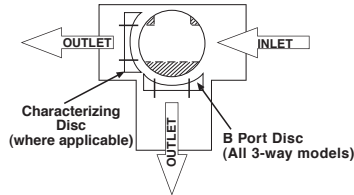
##### Three-way Mixing



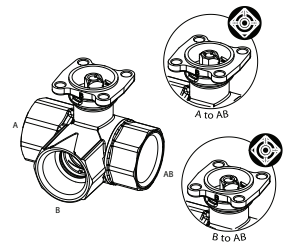
\*The A-port must be piped to the coil to maintain proper control.

\*The B-port yields 70% of the A-port flow.

##### Three-way Diverting



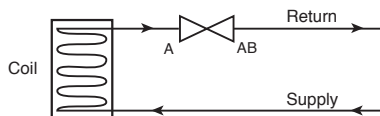
\*The B port should be piped as the bypass port.



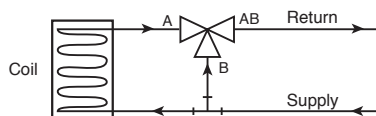
### Operation/Installation

**Correct Piping:** 2-way valves should be installed with the disc upstream. If installed with disc downstream, flow curve will be deeper. If installed "backwards" it is NOT necessary to remove and change. No damage or control problems will occur.

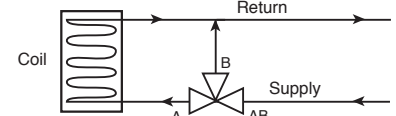
Two-Way Valve Piping Diagram  
(1 Input, 1 Output)



Three-Way Mixing Valve Piping Diagram  
(2 Inputs, 1 Output)



Three-Way Diverting Valve Piping Diagram  
(1 Input, 2 Outputs)



3-way valves must be piped correctly. They can be mixing or diverting. Mixing is the preferred piping arrangement.

The A-port must be piped to the coil to maintain proper control. The B-port restricts flow by 30% of A-port value.

The BELIMO Characterized Control Valve is a CONTROL valve, not a manual valve adapted for actuation. The control port is the A-port. It is similar to the globe valve in that the middle port is the B or bypass port. The common port AB is on the main opposite the A-port. These diagrams are for typical applications only. Consult engineering specification and drawings for particular circumstances.

**Three-Way Mixing Valve Piping Diagram**  
(2 Inputs, 1 Output)

**Three-Way Diverting Valve Piping Diagram**  
(1 Input, 2 Outputs)

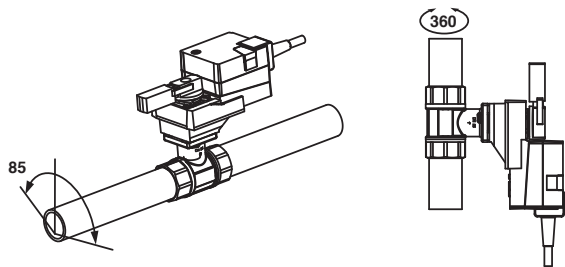
**Incorrect Piping**

**WARNING! Do Not Pipe in this manner! Note Valve Porting! The A port must be piped to the coil! Not the B port!**

Flow is not possible from A to B. If AB port is not piped as the common port, the valve must be re-piped. It is good practice to install a balancing valve in the bypass line. These valves are intended for closed loop systems. Do not install in an open loop system or in an application that is open to atmospheric pressure.

### Mounting

The valves can be mounted in any position, except stem below horizontal.



The flange allows the actuator to be either parallel or perpendicular to the pipe; there are four orientations possible.

If field installing a spring return actuator, disconnect power and allow actuator to spring closed. Flip actuator over if necessary to achieve proper rotation direction. **DO NOT USE THE REVERSING SWITCH TO DO THIS.**

### Two-way Valves Mounting

**For NORMALLY CLOSED operation:**

The ball of the valve must be rotated so that the ball is CLOSED to flow. The actuator should be mounted with the clamp fully rotated CW (R). Spring return actuators will show the CW (R) symbol near the clamp and position indicator. Depressing the gear release to move the clamp rotates non-spring return actuators.

**For NORMALLY OPEN operation:**

The ball of the valve must be rotated so that the ball is OPEN to flow. The actuator should be mounted with the clamp fully rotated CCW (L). Spring return actuators will show the CCW (L) symbol near the clamp and position indicator. Depressing the gear release to move the clamp rotates non-spring return actuators. There are marks on the top of the valve stem, which indicate the port directions.

### Three-way Valves Mounting

The control port is ALWAYS the straight main run. The bypass port is ALWAYS the branch tee.

**For NORMALLY CLOSED Control Port operation:**

The ball of the valve must be rotated CW (R) so that the "A" port is CLOSED to flow. The actuator should be full CW (R) rotation of the clamp. Spring return actuators will show the CW (R) symbol near the clamp and position indicator. CCW (L) rotation of the actuator will open the control port and close the bypass port.

**For NORMALLY OPEN operation:**

The ball of the valve must be rotated CCW (L) so that the "A" port is OPEN to flow. The actuator should be full CCW (L) rotation of the clamp. Spring return actuators will show the CCW (L) symbol near the clamp and position indicator. CW (R) rotation of the actuator will close the control port and open the bypass port. There are marks on the top of the valve stem which indicate the port directions.

Then the actuator-linkage can be set onto the valve. The square hole of the adapter fits easily onto the square stem extension. Rotate the ball as necessary using a wrench.

**Do not force. Do not use the actuator to turn the pipe or the stem. Do not use any toothed tool such as pliers, which may damage the stem.**

- Check that the actuator rotates so that the valve seats for close off and also rotates open to achieve full Cv. Use the gear release or the AF crank to verify. For LF or NF models apply power and control signal if necessary.
- Verify that CCW (L) rotation of the actuator will open the ball to flow.
- Install and tighten the hold down screw not more than 1/2 turn beyond the point where resistance is felt.

### Installation

1. Inspect shipping package, valve, linkage, and actuator for physical damage. If shipping damage has occurred notify appropriate carrier. Do not install.
2. Install valve with the proper ports as inlets and outlets. See drawings on page 1. Check that inlet and outlet of 2-way valves are correct; check that the "A", "B", and "AB" ports of three-way valves are piped correctly. Flow direction arrows must be correct.
3. Blow out all piping and thoroughly clean before valve installation.
4. Clean male pipe threads with wire brush and rag. If threads have been damaged or exposed to weather, running a tap or die over the threads may straighten them. Clean pipes, threads, and valve threads before installation; check for any foreign material that can become lodged in trim components. Strainers should be cleaned after initial startup.
5. Pipe sealing compound should be applied sparingly after cleaning and may not be applied to the two lead threads of a screwed pipe, which are innermost inside the valve. Sealing compound is to be placed on male threads only. The purpose is to lubricate the pipes when tightening.
6. Valve must be installed with the stem towards the vertical, not below horizontal.
7. Start the connection by turning the valve or pipe by hand as far as possible. Be certain the threads mate by the "feel" of the connection.
8. Use wrenches to tighten the valve to the pipe. Do not over tighten or strip the threads. Two wrenches are necessary to avoid damaging the valve.
9. Two-way valve Normally Open or Closed configurations must be verified by examining both the mechanical drawings and the valve and actuator. See details on page 1.
10. Three-way valve Normally Open or Closed configurations for the Control Port and the Bypass Port must be verified by examining both the mechanical drawings and the valve and actuator. See details on page 1.

### Warning!

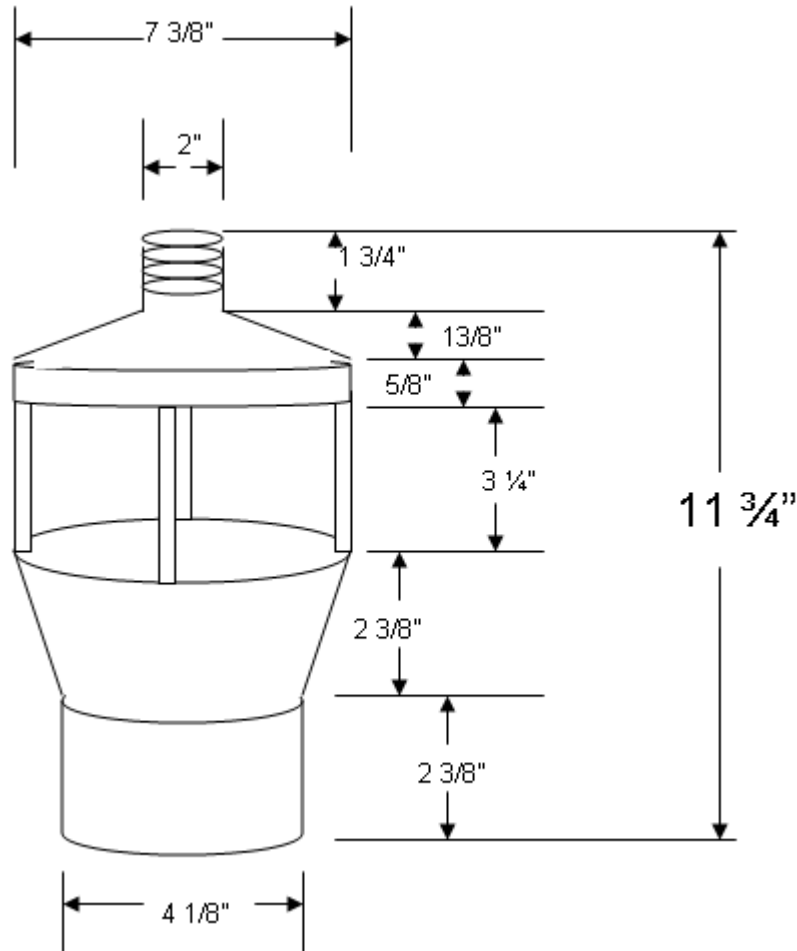
- Valve should not be used for combustible gas applications. Gas leaks and explosions may result. Do not install in systems, which exceed the ratings of the valve.
- Avoid installations where valve may be exposed to excessive moisture, corrosive fumes, vibration, high ambient temperatures, elements, or high traffic areas with potential for mechanical damage.
- Valve assembly location must be within ambient ratings of actuator. If temperature is below -22°F a heater is required.
- The valve assembly will require heat shielding, thermal isolation, or cooling if combined effect of medium and ambient temperatures – conduction, convection, and radiation – is above 122°F for prolonged time periods at the actuator.
- Following standard procedure, a strainer should be installed before the coil and valve or in another appropriate place in the system.
- Visual access must be provided. Assembly must be accessible for routine schedule service. Contractor should provide unions for removal from line and isolation valves.
- Avoid excessive stresses. Mechanical support must be provided where reducers have been used and the piping system may have less structural integrity than full pipe sizes.
- Sufficient upstream and downstream piping runs must be provided to ensure proper valve capacity and flow response. Five diameters in each direction are recommended.
- Life span of valve stems and O-rings is dependent on maintaining non-damaging conditions. Poor water treatment or filtration, corrosion, scale, other particulate can result in damage to trim components. A water treatment specialist should be consulted.
- Normal thread engagement between male pipe thread and valve body should be observed. Pipe run that is in too far will damage the valve.

**Air Gap**

## Stainless Steel Air Gap

### Function

The Stainless Steel Air Gap is designed to ensure there is an open air separation between rainwater and domestic water. The Air Gap ensures there is no cross contamination required by many states. The air gap is available in 1/2", 3/4", 1", 1 1/2" and 2".



# RMS 200 Controller



The **RMS Series 200 Rainwater Harvesting Controller** is specifically designed to operate the RMS Rainwater Management Solutions Rain Harvesting System. This controller regulates the rainwater collection system, monitors and controls the system and provides data on the performance of the system.

The RMS Series 200 Controller displays all of the information on an intuitive 10" color touch screen display. Each RMS Series 200 controller is fully customizable for a project's specific needs.

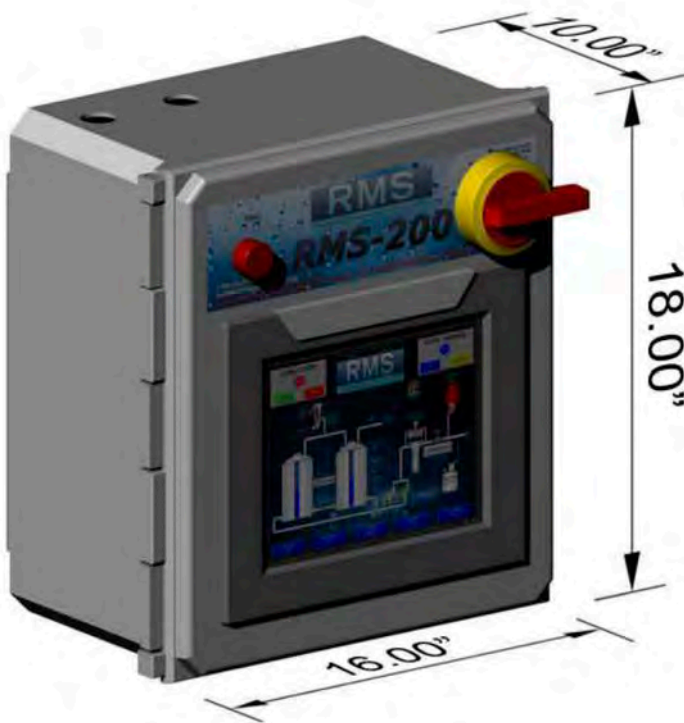
Communications for building automation systems are available via a RS-482 connection and MODBUS RTU protocol. Alarms can be provided to warn against failures or needed maintenance.

All RMS Series 200 Controllers are manufactured, programmed, and tested in our UL 508A Panel Shop.



### ENCLOSURE GENERAL SPECIFICATIONS:

- Overall Dimensions: 18" x 16" x 10" fiberglass enclosure rated NEMA 4X
- Operating Temperature: 0-50° C
- Relative Humidity: 10-95% (non condensation)
- Pad-lockable disconnect switch
- Red LED/buzzer for local alarm indication
- All circuit breaker construction (no fuses to replace)
- All electrical connections made via triple deck screw terminal block in inside enclosure



### TOUCH SCREEN:

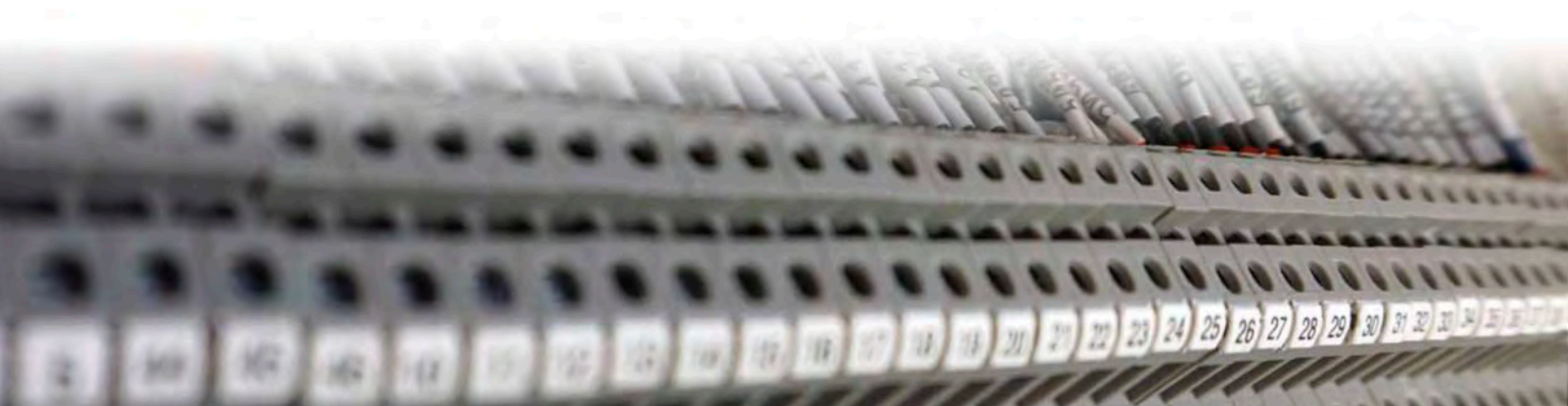
- TFT type color touch screen
- Resolution: 800 x 600 (SVGA)
- White LED backlight
- Touch-resistive analog

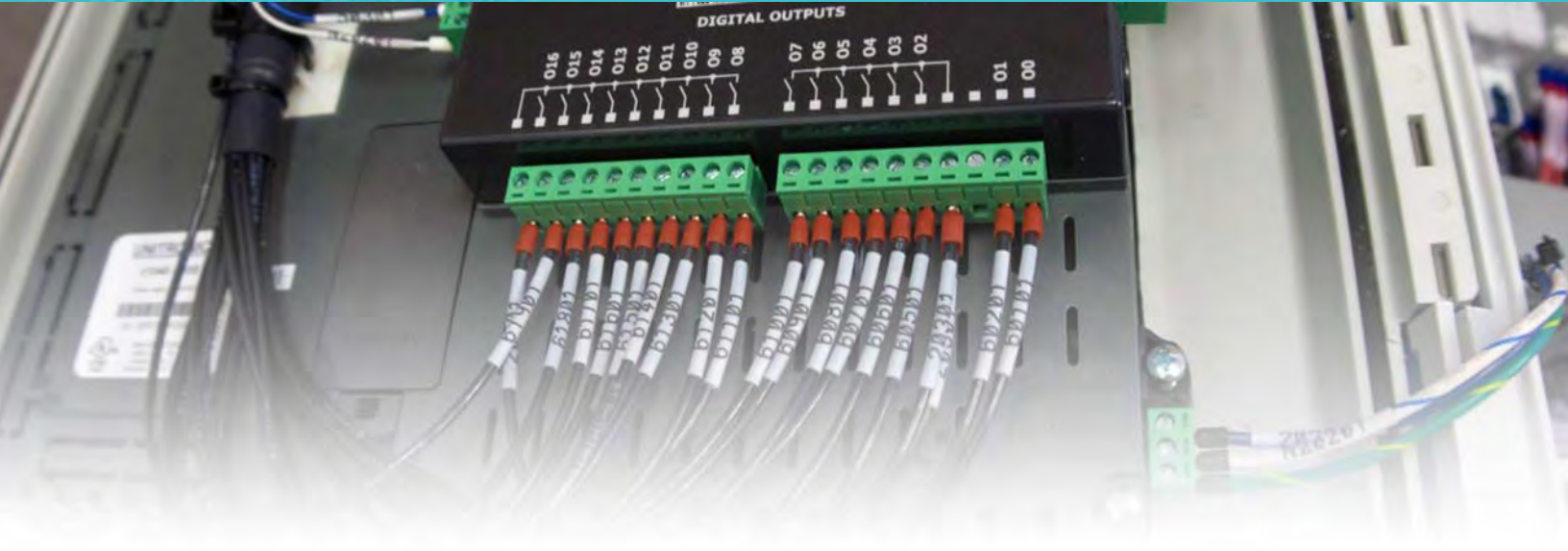
### COMMUNICATION:

- RS-482 Connector
- Communication with building automation via MODBUS RTU

### HARDWARE INPUTS/OUTPUTS:

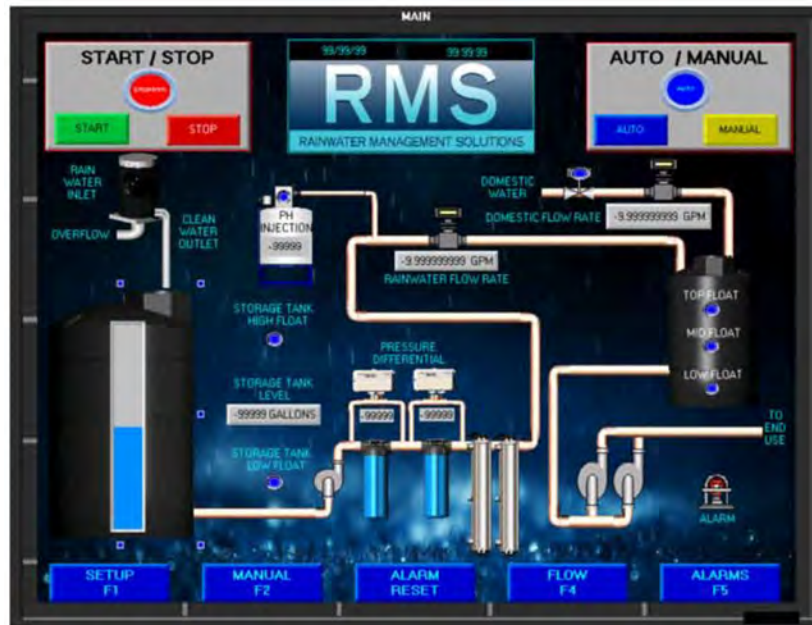
- Hardware inputs and outputs can be customized to meet project needs
- Analog inputs: 4 (max)
- Digital inputs: 16 (max)
- Analog outputs: 4 (max)
- Digital outputs: 16 (max)





### CONTROLLER CUSTOMIZATION:

- Main screen shows all components and their status
- Setup screen to set all component parameters as necessary
- Manual screen allows user to control outputs manually and view the status of the input simultaneously
- Flow screen to show all flow rates (current and totalized)
- Alarm Screen to show fault status on the system - allows alarms to be acknowledged



(sample screen)

# Single Point Power Source



## SINGLE POINT POWER SOURCE

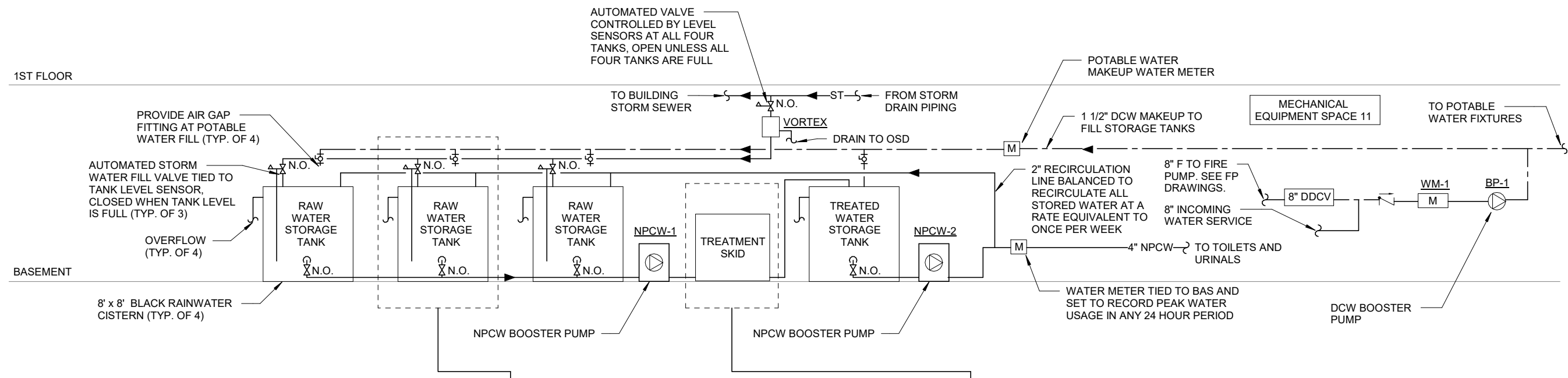


The RMS Single point Power Distribution Panel being provided for **Illini Hall** project will be provided in a NEMA3R Polycarbonate enclosure with hinged cover. The Panel will be fed from the building panel by the electrician with specified voltage with minimum of specified amps, not to exceed 125amps. The Panel will then include all components for secondary protection, power conversion, and isolation.

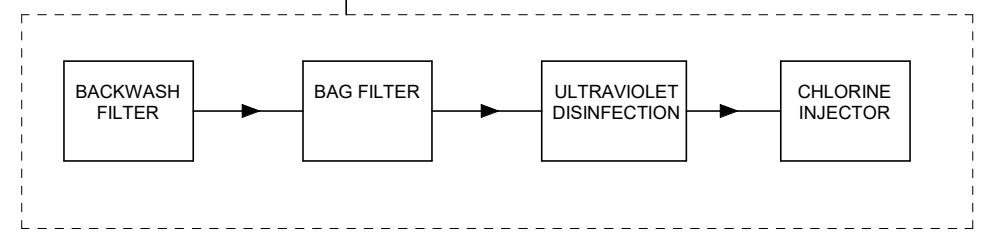
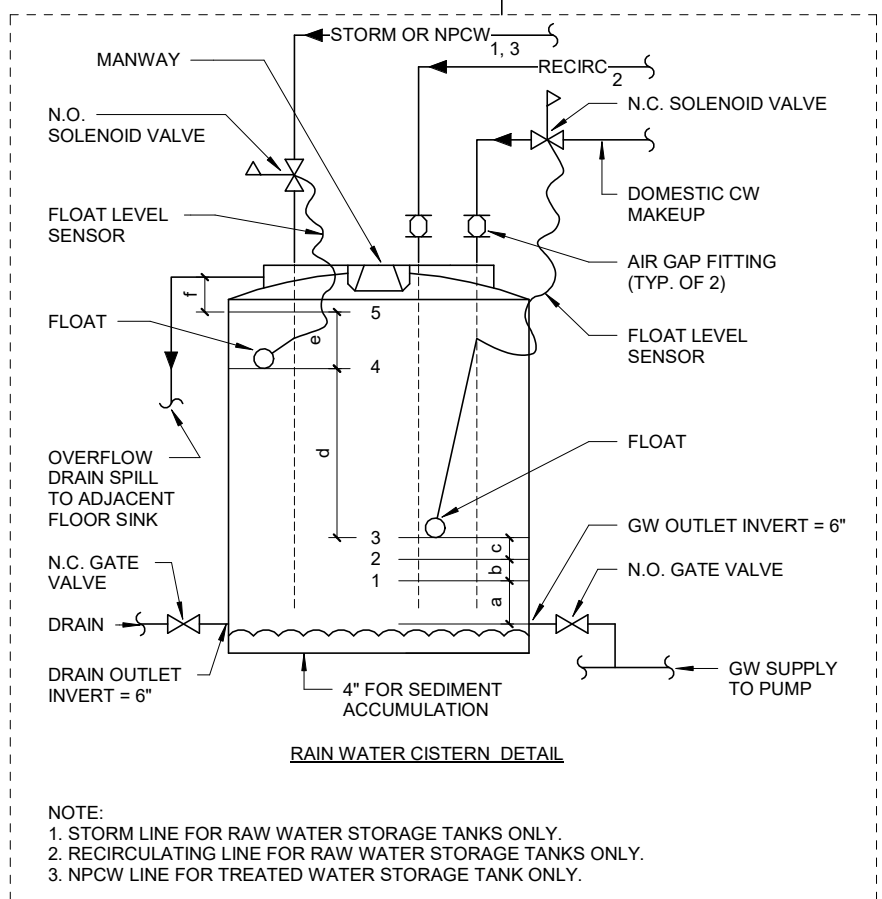
All components housed in the RMS Single Point Power Distribution Panel will be prewired and the components housed in the equipment bay with the panel will be prewired to the panel by RMS. All components that are field installed and primary power to the panel will be wired on site by the electrician. All wiring done within the panel between circuit breakers and disconnect will be 14 AWG – 6 AWG.

# DIAGRAMS AND DRAWINGS

FLOW RISER DIAGRAM  
BASEMENT EQUIPMENT LAYOUT  
ROOF DRAIN PLAN  
EQUIPMENT SCHEDULE SHEET

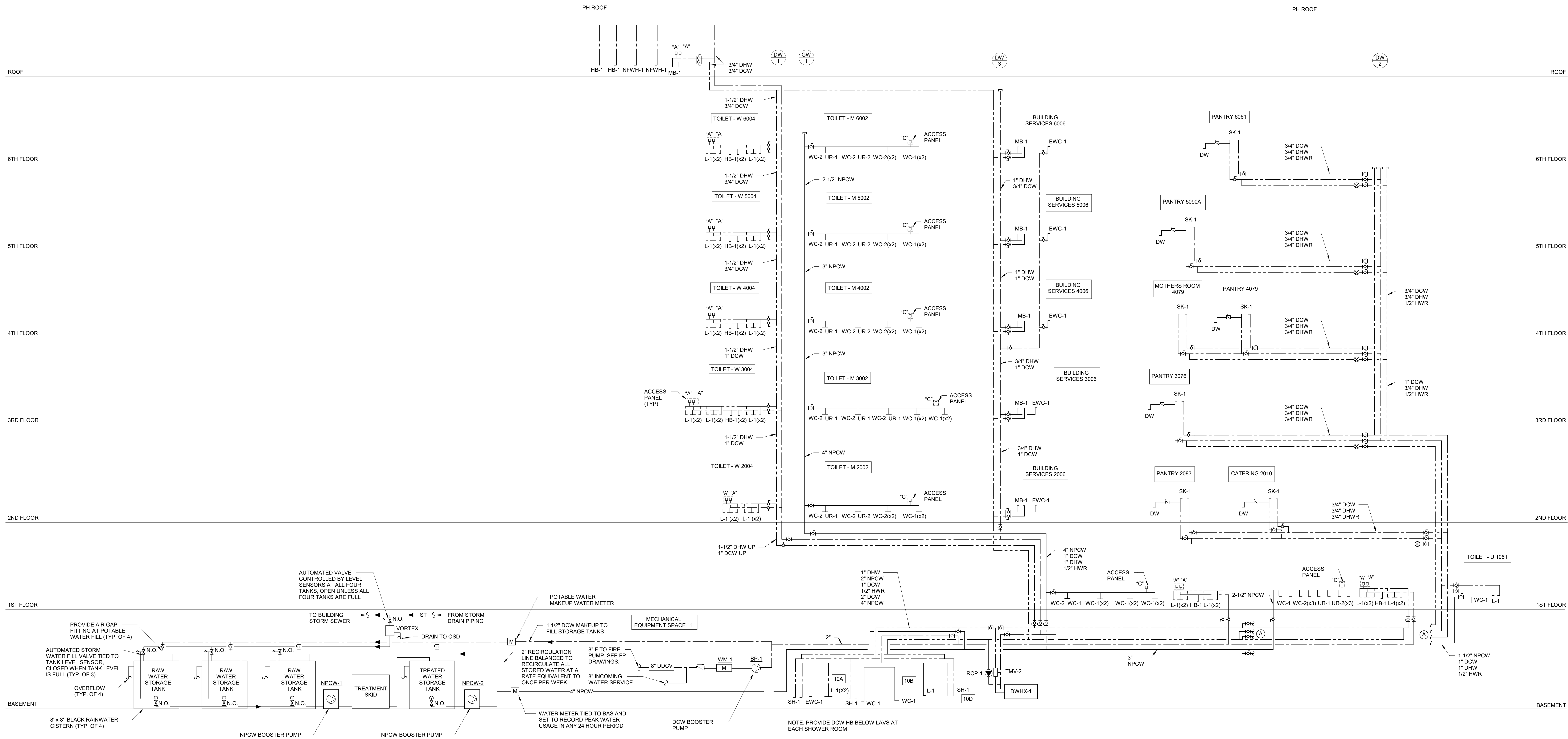


FLOAT LEVEL SEQUENCE OF OPERATIONS			
FLOAT LEVEL	OPERATION	ELEVATION	ACCUMULATED USABLE GRAY WATER (GALLONS)
1	LOW LEVEL ALARM	a = 6"	176
2	DCW OPEN	b = 3"	265
3	DCW CLOSED	c = 3"	353
4	ST CLOSED	d = 61"	2147
5	ST HIGH LEVEL ALARM	e = 10"	2470
OVER FLOWS	-	f = 3"	-



NOTE:  
 1. STORM LINE FOR RAW WATER STORAGE TANKS ONLY.  
 2. RECIRCULATING LINE FOR RAW WATER STORAGE TANKS ONLY.  
 3. NPCW LINE FOR TREATED WATER STORAGE TANK ONLY.

**NON-POTABLE WATER STORAGE AND TREATMENT SCHEMATIC**



1 DOMESTIC AND GREY WATER RISER DIAGRAMS  
NTS

NOTE: CONTRACTOR SHALL OBTAIN AND VERIFY ALL DIMENSIONS AND CONDITIONS AT JOB SITE AND BE FULLY RESPONSIBLE FOR SAME.

REVISIONS		DRAWN	PREPARED
NO.	DATE	REMARKS	MH
1	9/14/20	DESIGN DEVELOPMENT	TRACED
2	1/14/21	50% CONSTRUCTION DOCUMENTS	N/A
3	4/6/21	75% CONSTRUCTION DOCUMENTS	CHECKED
			DF

**CANNONDESIGN**  
225 North Michigan Avenue, Suite 1100  
Chicago, Illinois 60601  
T: 312.332.9600  
F: 312.332.9601  
PROFESSIONAL DESIGN FIRM  
LICENSE NUMBER 184.005683  
www.cannondesign.com  
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**Environmental Design International**  
Civil and Environmental  
33 West Monroe St, Suite 1825  
Chicago, IL 60661  
(312) 345-1400  
**Kirkgaard**  
Acoustic  
801 West Adams St 8th Floor  
Chicago, IL 60607  
(630) 768-9198

**Lerch Bates**  
Elevator and Facade Access  
216 South Jefferson St, Suite LL2  
Chicago, IL 60661  
(312) 332-5444  
**Tgda**  
Landscape Architect  
3233 W Le Moine St. No. 1  
Chicago, IL 60651  
(312) 481-8432

**Vantage Technology Consulting Group**  
AV, IT and Security  
150 Baker Avenue Extension, Suite 310  
Concord, MA 01742  
(978) 341-0700



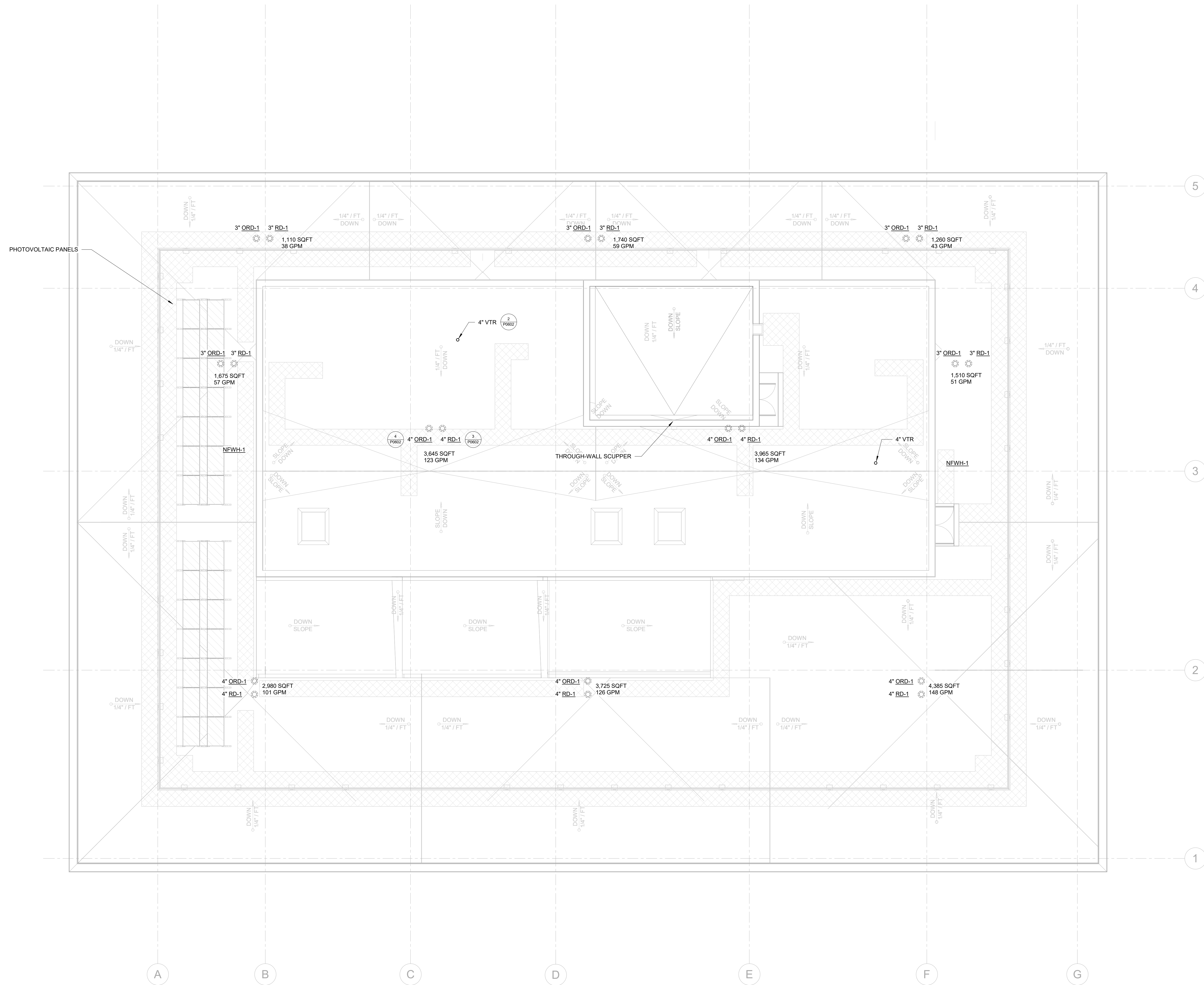
State of Illinois  
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Illinois Capital Development Board

**DOMESTIC WATER RISER DIAGRAM**  
ILLINOIS HALL REPLACEMENT  
UNIVERSITY OF ILLINOIS AT URBANA - CHAMPAIGN  
725 S WRIGHT ST, CHAMPAIGN, IL 61820

U/NC PROJECT NO. U19019	CDB PROJECT NO. 830-010-349 - Phase 3
CD PROJECT NO. 005895.00	DATE 4/8/2021
SHEET NO. <b>P0402</b>	

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**1 ROOF PLUMBING PLAN**  
1/8" = 1'-0"



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**CANNONDESIGN**  
225 North Michigan Avenue, Suite 1100  
Chicago, Illinois 60601  
T: 312.332.9800  
F: 312.332.9801  
PROFESSIONAL DESIGN FIRM  
LICENSE NUMBER 184.005683  
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**Environmental Design International**  
Civil and Environmental  
33 West Monroe St., Suite 1825  
Chicago, IL 60603  
(312) 345-1400  
**Kirkegaard**  
Acoustic  
801 West Adams St 8th Floor  
Chicago, IL 60607  
(630) 768-9198

**Lerch Bates**  
Elevator and Facade Access  
216 South Jefferson St., Suite LL2  
Chicago, IL 60661  
(312) 332-6444  
**Tgda**  
Landscape Architect  
3233 W Le Moine St. No. 1  
Chicago, IL 60651  
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**ROOF LEVEL PLUMBING PLAN**  
ILLINI HALL REPLACEMENT  
UNIVERSITY OF ILLINOIS AT URBANA - CHAMPAIGN  
725 S WRIGHT ST, CHAMPAIGN, IL 61820

UINC PROJECT NO. U19019	CDB PROJECT NO. 830-010-349 - Phase 3
CD PROJECT NO. 005895.00	DATE 4/8/2021
SHEET NO. <b>P0108</b>	

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