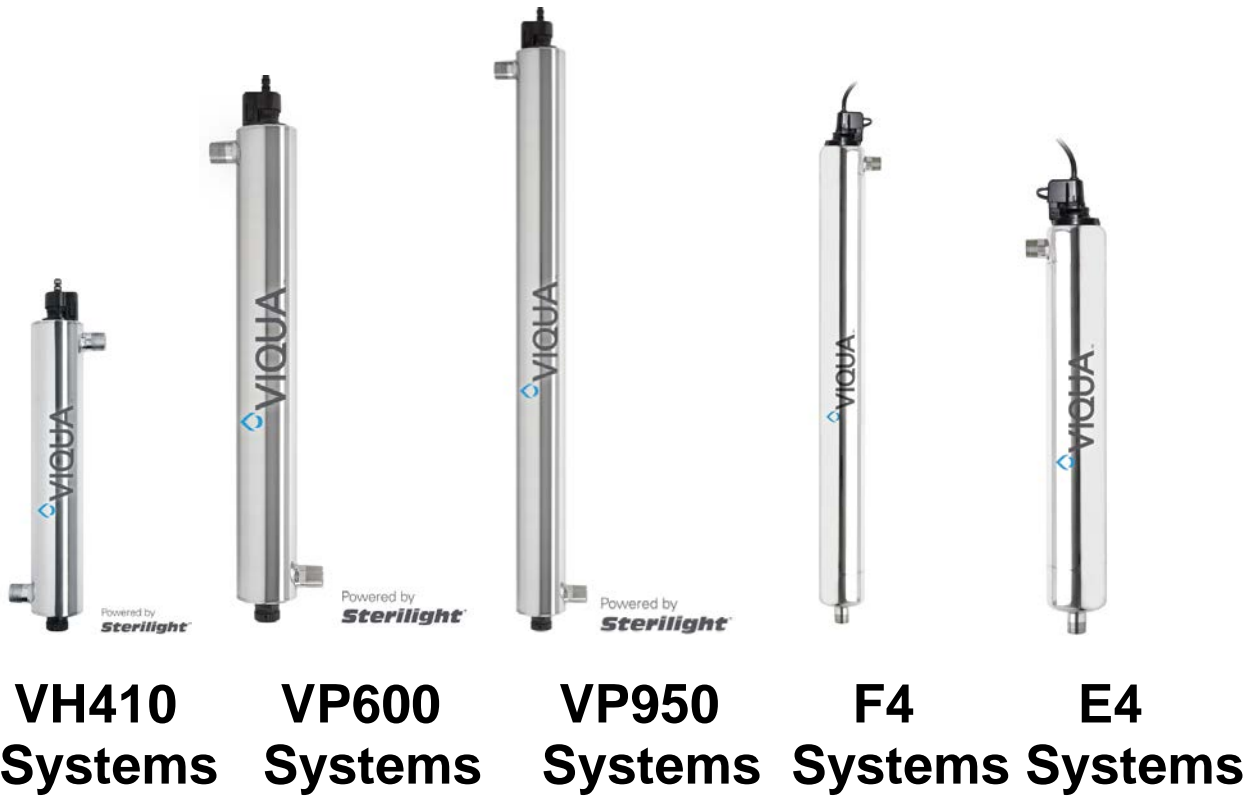




High Output Professional Series



**VH410
Systems**

**VP600
Systems**

**VP950
Systems**

**F4
Systems**

**E4
Systems**

Table of Contents

Preface.....	iii
Contact Information.....	iii
About VIQUA – a Trojan Technologies Business.....	iii
Scope.....	iii
1.0 Project & System Description.....	1
1.1 Project Description.....	1
1.2 System Description.....	2
2.0 Decision Flow Chart.....	3
3.0 Product Drawings.....	4
3.1 Install Options.....	4
3.1.1 Vertical Install Drawing.....	5
VH410, VP600, and VP950 Systems.....	5
E4 and F4 Systems.....	6
3.1.2 Horizontal Install Drawing.....	7
VH410, VP600, and VP950 Systems.....	7
E4 and F4 Systems.....	8
3.2 Exploded View.....	9
4.0 System Overview.....	10
4.1 Pressure Drop.....	10
4.2 Dose Curves.....	11
5.1.2 Degradation Chart.....	15
5.1.3 Temperature Profile.....	16
5.2 Chamber.....	17
5.3 Quartz Sleeve.....	17
5.4 Controller Functionality.....	18
5.4.1 Lamp Tracking.....	18
5.4.2 UV Sensor.....	18
5.4.3 Sensor Response Curve.....	19
5.4.4 Other Controller Features.....	20
6 Additional Optional Features.....	21
6.1 NSF Validated Systems.....	21
6.2 Integrated Home Systems.....	21

6.3	Low UVT Applications	22
6.4	Flow management fittings	23
6.4.1	Solenoid Valve	23
6.4.2	Temperature Management Valve	23
6.4.3	Flow Restrictor	23
6.5	Remote Capabilities	24
7	Certifications.....	25
8	Warranty	25
	VIQUA Declaration	26

PREFACE

Contact Information

425 Clair Road West
Guelph, Ontario, Canada
N1L 1R1
Tel: 519-763-1032
Fax: 519-763-5069
info@viqua.com
www.viqua.com

About VIQUA – a Trojan Technologies Business

We believe clean water is an invaluable resource. That's why, for more than a quarter of a century, we have led the development of water treatment solutions using environmentally friendly ultraviolet (UV) light. Today, VIQUA has the largest installed base of UV systems in operation on the planet, and many of our innovations define the industry standards for safeguarding our water from the damaging effects of microbial contamination.

From offices and facilities in eight countries, the 800 employees of Trojan are united by an unwavering commitment to deliver advanced water treatment solutions that make water safety a reality worldwide.

VIQUA is an ISO9001:2008 registered company specializing in the design, manufacture and sale of ultraviolet systems for:

- household drinking water
- light commercial drinking water
- point-of-use treatment
- point-of-entry treatment

VIQUA has over 600,000 systems installed worldwide and VIQUA systems can be found in almost every country in the world. Applications of VIQUA systems include rain water harvesting, ground water treatment, disaster relief, humanitarian aid, medical devices and bottled-water refill stations.

Scope

This document highlights the features and specifications of the professional high output family of VIQUA systems. This family includes VH410, VP600, VP950, E4, F4, and all variations of these base systems. Appropriate applications for these systems vary in accordance with the sizes available; however, all the systems are suited for light commercial application

1.0 PROJECT & SYSTEM DESCRIPTION

1.1 Project Description

System Type	Available Systems				
	VH410 Systems	VP600 Systems	VP950 Systems	E4 Systems	F4 Systems
Base System	VH410	VP600	VP950	E4	F4
Monitored Systems	VH410M	VP600M	VP950M	E4+/E4-V+	F4+/F4-V+
Low UVT Monitored Systems (> 50%)	-	-	-	E4-50+	F4-50+
Integrated Home System	VH410-F20	-	-	IHS22-E4	-
NSF 55-Class B Certified Systems	-	-	-	E4-V/E4-V+	F4-V/F4-V+

Project Name	Guidelines				
	VH410 Systems	VP600 Systems	VP950 Systems	E4 Systems	F4 Systems
Maximum flow rate Dose: 30 mJ/cm ² UVT: > 95%	18 GPM (70 L/min)	30 GPM (113 L/min)	46 GPM (175 L/min)	22 GPM (83 L/min)	36 GPM (136 L/min)
Maximum flow rate Dose: 30 mJ/cm ² UVT: > 50%	-	-	-	9 GPM (34 L/min)	15 GPM (57 L/min)
NSF Certified Maximum flow rate Dose: 16 mJ/cm ² UVT: > 70%	-	-	-	15.8 GPM (60 L/min)	26.1 GPM (99 L/min)
Operating pressure	15 – 125 psi (103-861 kPa)			4 – 125 psi (27.5 - 861 kPa)	
Ambient air temp.	0°C (32°F) - 40°C (104°F)			0°C (32°F) - 50°C (122°F)	
Ambient water temp.	2°C (36°F) – 40°C (104°F)				
*Hardness	< 7 gpg (120 mg/L)				
*Manganese content	< 0.05 ppm (0.05 mg/L)				
*Iron content	< 0.3 ppm (0.3 mg/L)				
*UVT	> 75%			E4/E4+/F4/F4+: > 75% E4-V/E4-V+/F4-V/F4-V+: > 70% E4-50+/F4-50+: 50-85%	
*Turbidity	< 1 NTU				

*after pretreatment

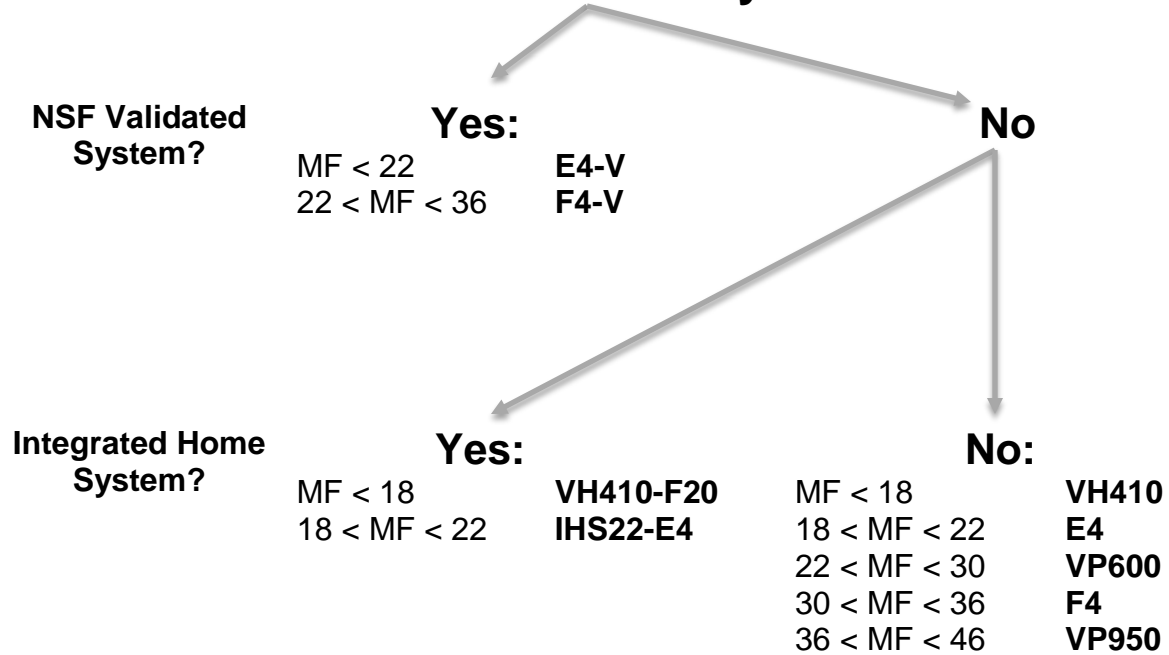
1.2 System Description

Model	VH410 Systems	VP600 Systems	VP950 Systems	E4 Systems	F4 Systems
Quantity					
Chamber					
Material	304 SS				
Dimensions	23.5" x 3.5" (59.6cm x 8.9cm)	30.7" x 3.5" (78cm x 8.9cm)	45.2" x 3.5" (114cm x 8.9cm)	30" X 4" (76cm x 10cm)	44 ¼" X 4" (112.5cm x 10cm)
Inlet & outlet ports	Combo ¾" FNPT/1" MNPT	1" MNPT	1.5" MNPT	1" MNPT	1" MNPT
Orientation	Vertical/Horizontal (Vertical is preferable)				
Electrical					
Power Supply	7.25" x 3.25" x 2.5" (18.6 x 8.1 x 6.4cm) (VH410)	8.8" x 3.2" x 2.5" (22.3 x 8.1 x 6. cm) (VP600M, VP950M)		8.5" x 6" x 3" (22 x 15 x 7.6cm)	
	9.25" x 3.25" x 2.5" (24 x 8.1 x 6.4cm) (VH410M, VP600M, VP950M)				
Voltage	120-240 V				
Frequency	50-60 Hz				
Max. current	1.5 Amps (VH410, VP600, VP950) 2.5 Amps (VH410M, VP600M, VP950M)			1.0 Amps	
Max. power consumption	60 W	78 W	110 W	83 W	130 W
Lamp power	46 W	58 W	90 W	70 W	110 W

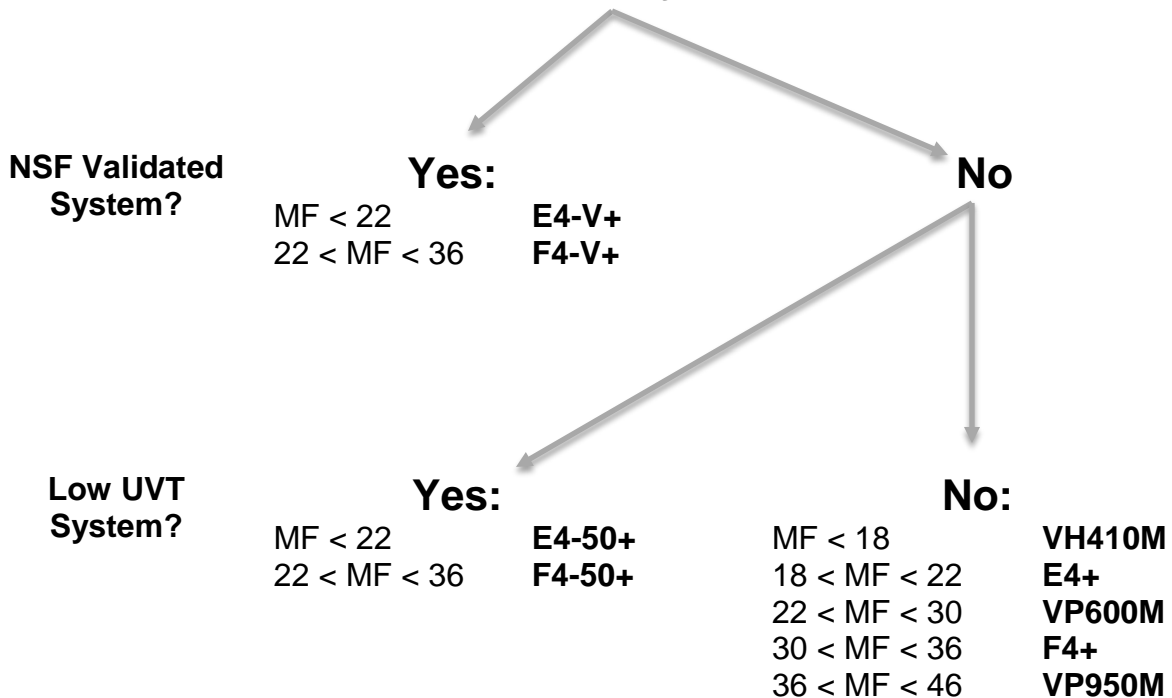
Spare Parts	Quantity	Optional Accessories	Quantity
Lamps		Dynamic flow restrictor	
Sleeves		Temperature management valve	
UV sensors (Monitored systems only)		Solenoid valve (Monitored systems only)	
		4-20 mA Interface (Monitored systems only)	
		Dry Contact (Monitored E4 and F4 systems only)	

2.0 DECISION FLOW CHART

Non-Monitored Systems:

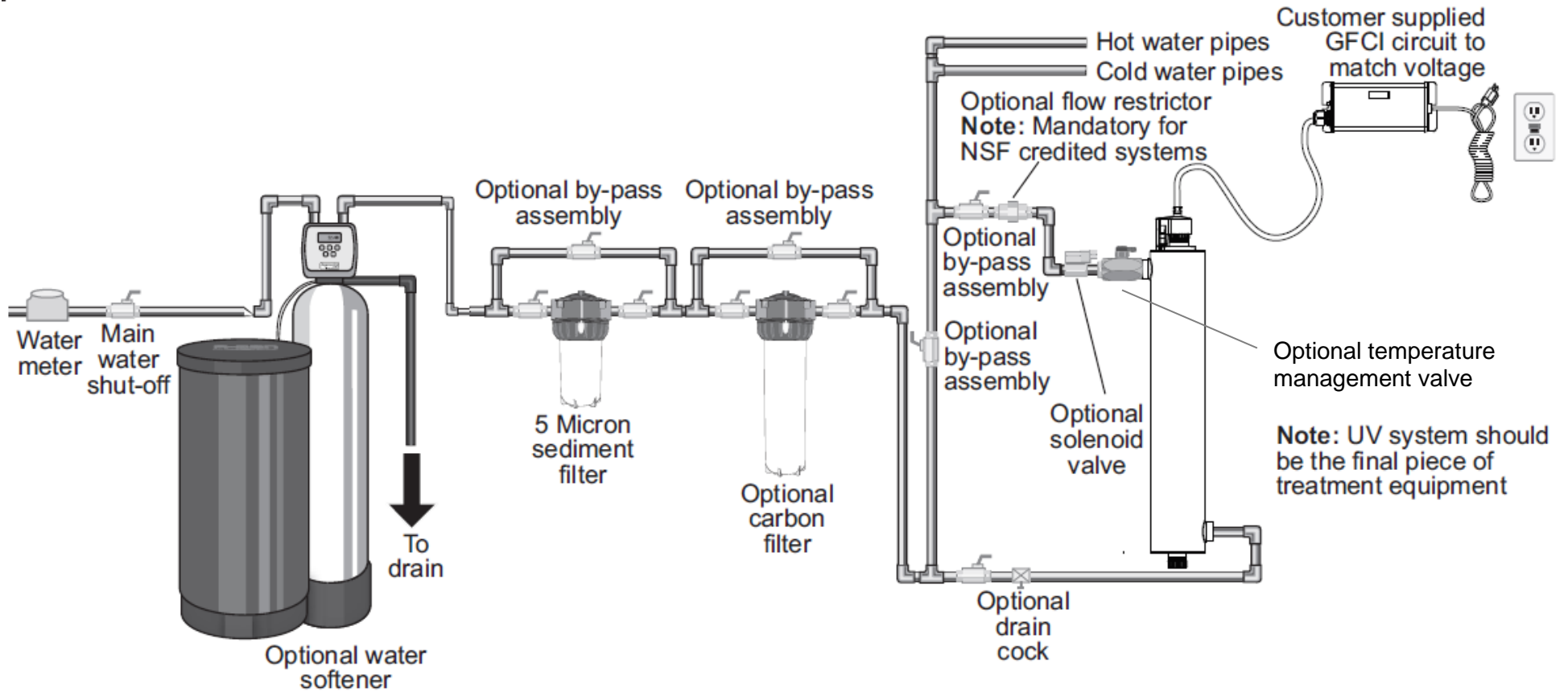


Monitored Systems:



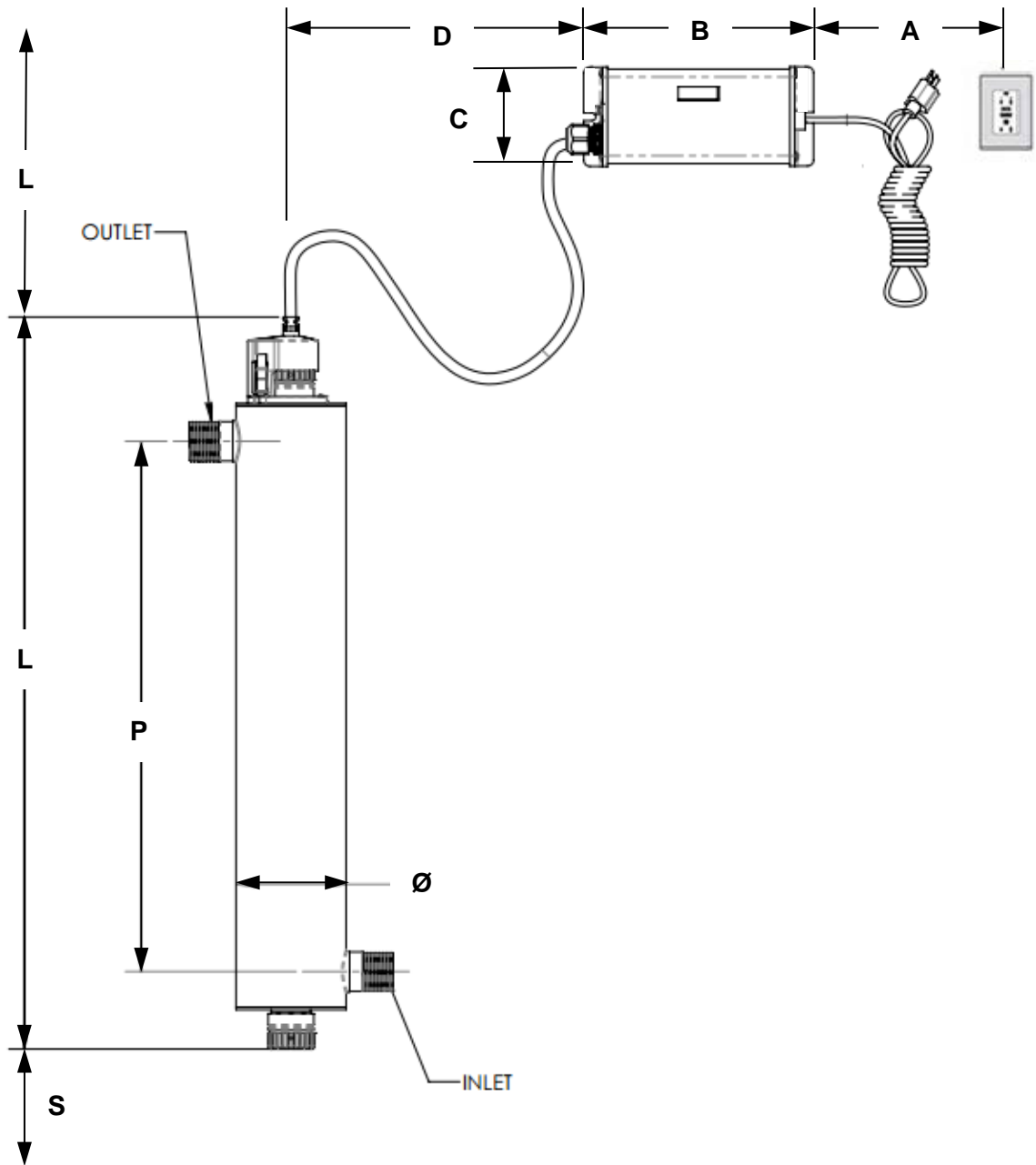
3.0 PRODUCT DRAWINGS

3.1 Install Options



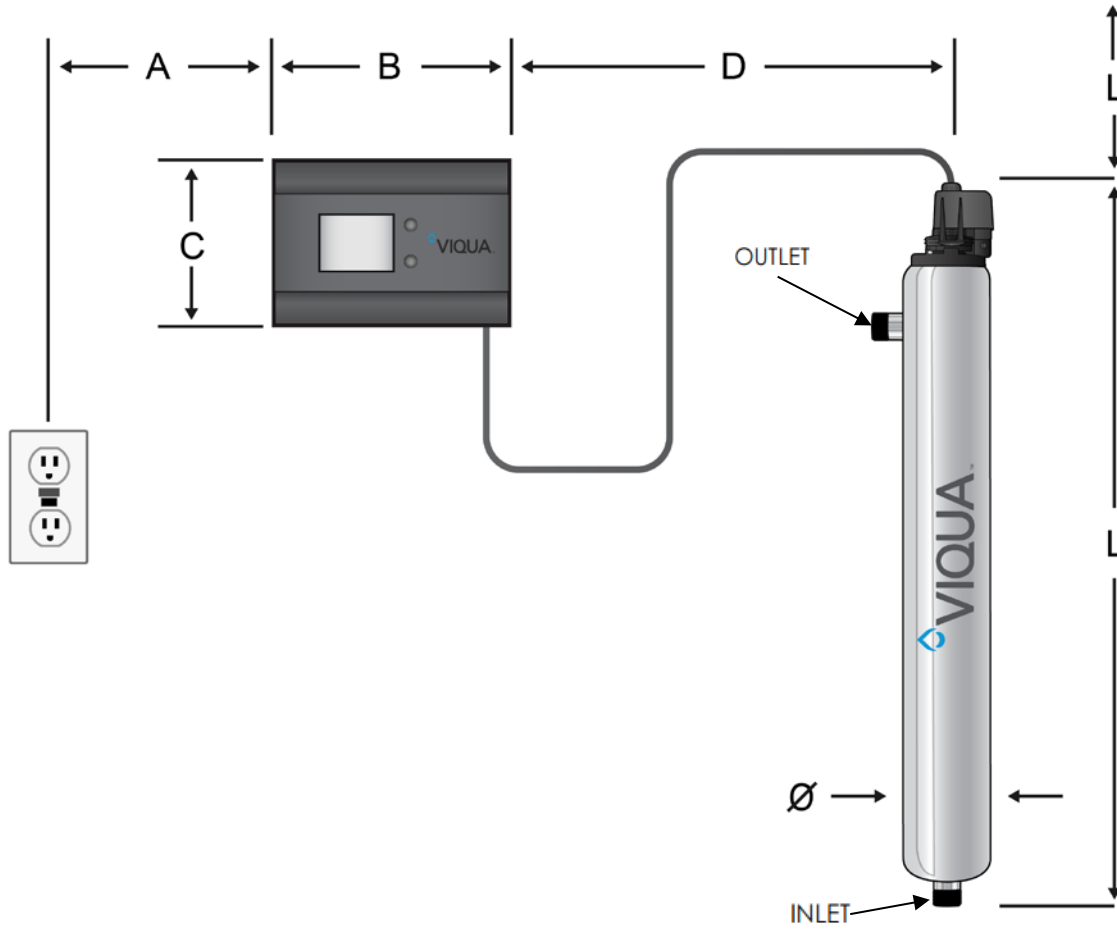
3.1.1 Vertical Install Drawing

VH410, VP600, and VP950 Systems



Item	L	S (min.)	Ø	P	A (max.)	B	C	D (max.)
VH410/VH410M	23.50" (59.70cm)	12.0" (30.5cm)	3.5" (8.9cm)	16.85" (42.80cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)
VP600/VP600M	30.70" (77.98cm)	12.0" (30.5cm)	3.5" (8.9cm)	24.31" (61.75cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)
VP950/VP950M	45.24" (114.94cm)	12.0" (30.5cm)	3.5" (8.9cm)	38.10" (96.77cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)

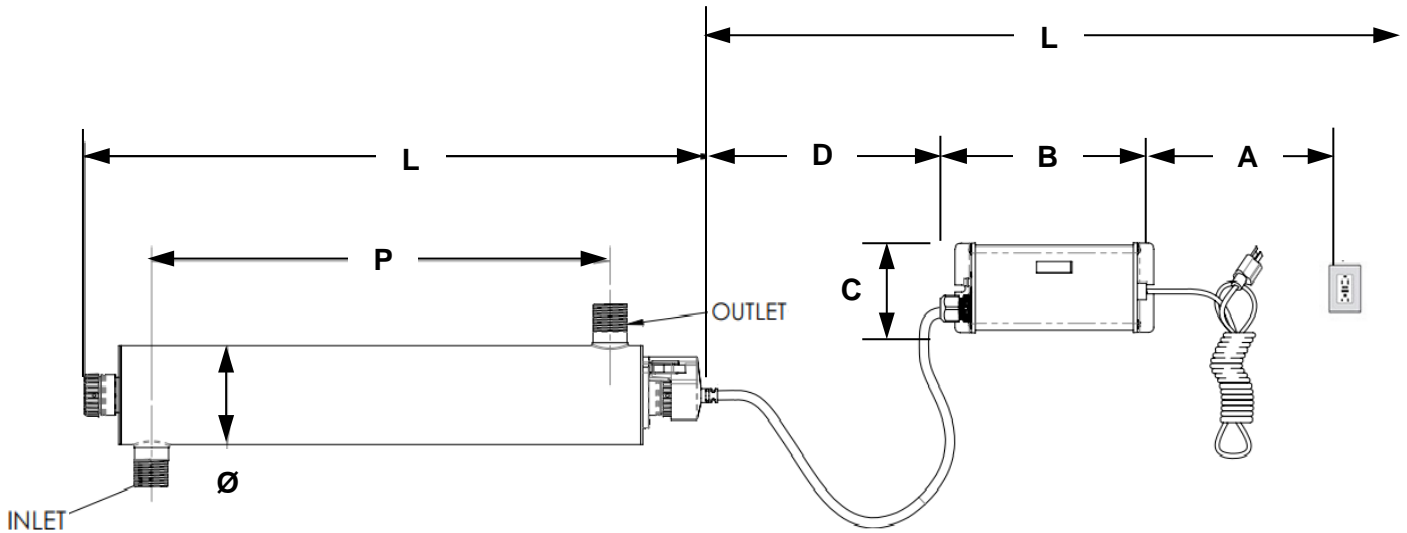
E4 and F4 Systems



Item	L	Ø	A	B	C	D (max.)
E4 Family	30" (76 cm)	4" (10 cm)	72" (183 cm)	8.5" (22 cm)	6" (15 cm)	54" (137 cm)
F4 Family	44.25" (112.4 cm)	4" (10 cm)	72" (183 cm)	8.5" (22 cm)	6" (15 cm)	54" (137 cm)

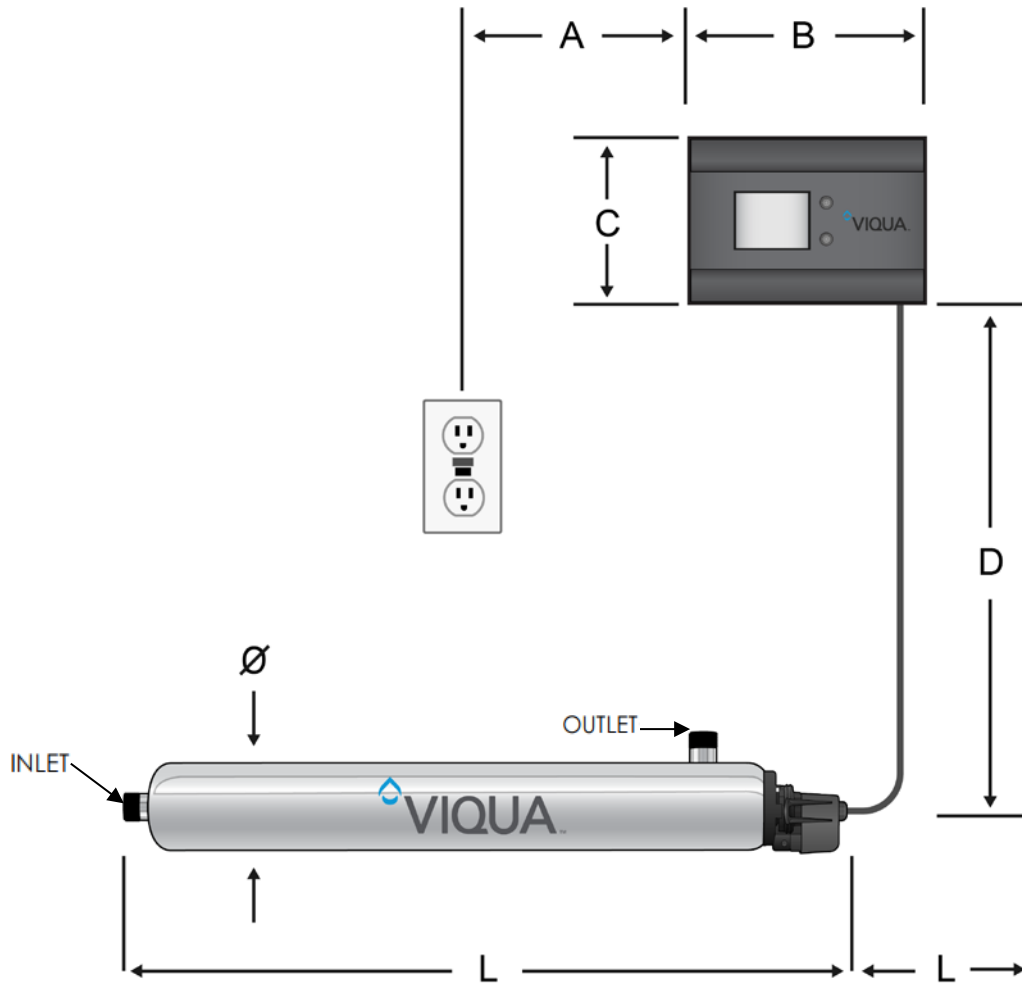
3.1.2 Horizontal Install Drawing

VH410, VP600, and VP950 Systems



Item	L	S (min.)	Ø	P	A (max.)	B	C	D (max.)
VH410/VH410M	23.50" (59.70cm)	12.0" (30.5cm)	3.5" (8.9cm)	16.85" (42.80cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)
VP600/VP600M	30.70" (77.98cm)	12.0" (30.5cm)	3.5" (8.9cm)	24.31" (61.75cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)
VP950/VP950M	45.24" (114.94cm)	12.0" (30.5cm)	3.5" (8.9cm)	38.10" (96.77cm)	78" (198cm)	6.8"/8.8" (17.3/22.4cm)	3.2" (8cm)	23" (58.4cm)

E4 and F4 Systems



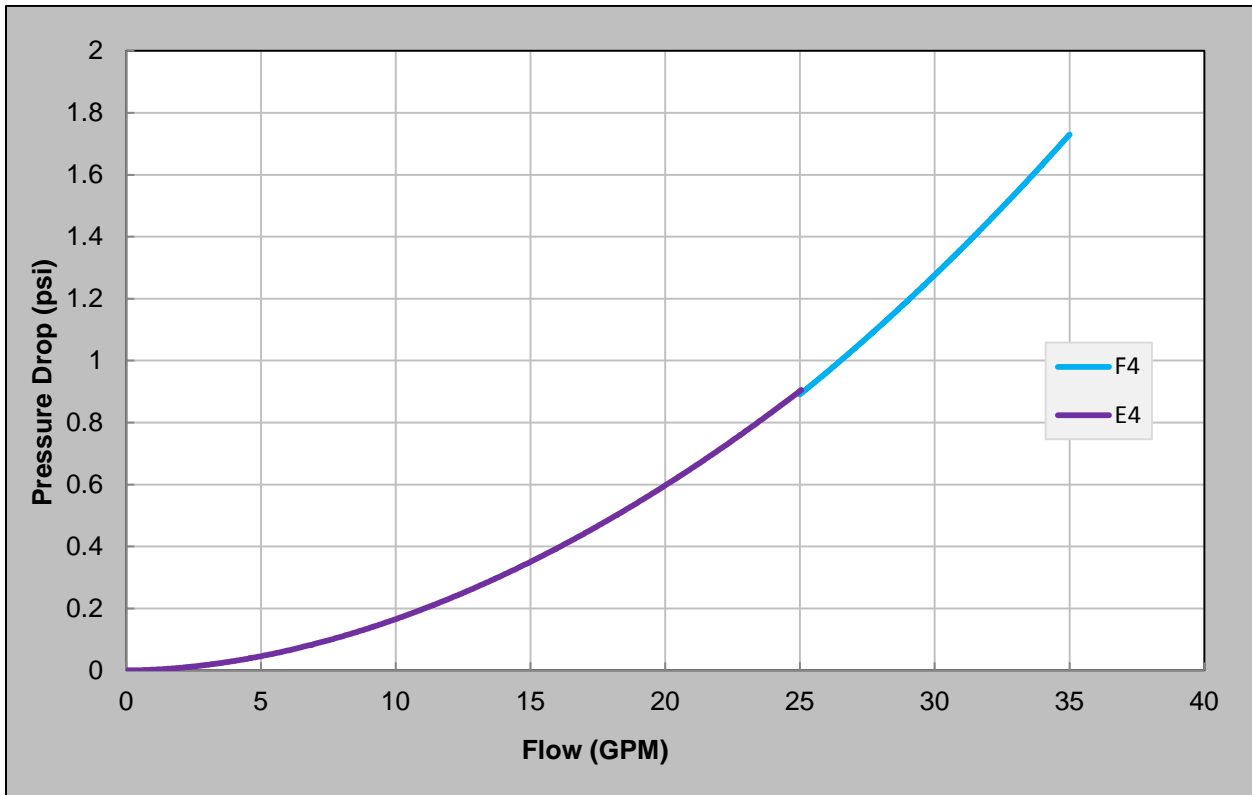
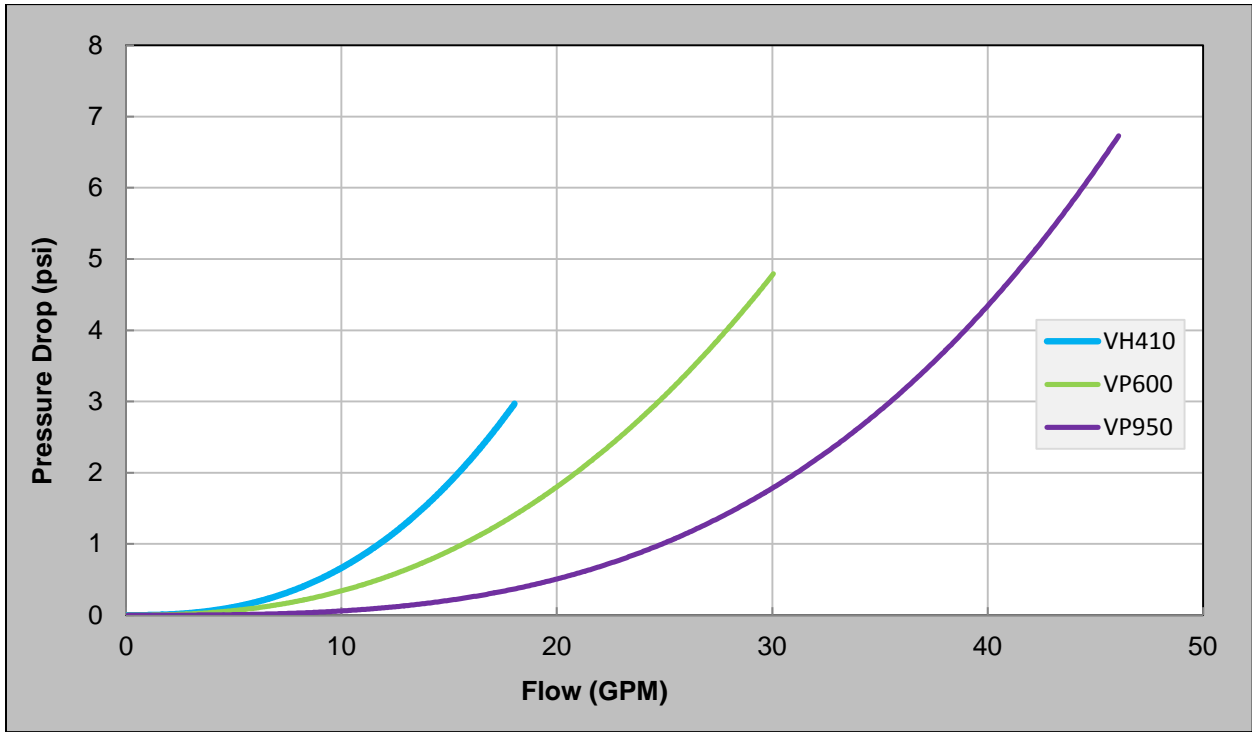
Item	L	Ø	A	B	C	D (max.)
E4 Family	30" (76 cm)	4" (10 cm)	72" (183 cm)	8.5" (22 cm)	6" (15 cm)	54" (137 cm)
F4 Family	44.25" (112.4 cm)	4" (10 cm)	72" (183 cm)	8.5" (22 cm)	6" (15 cm)	54" (137 cm)

3.2 Exploded View

Refer to .pdf and .step files for engineering drawings and part numbers.

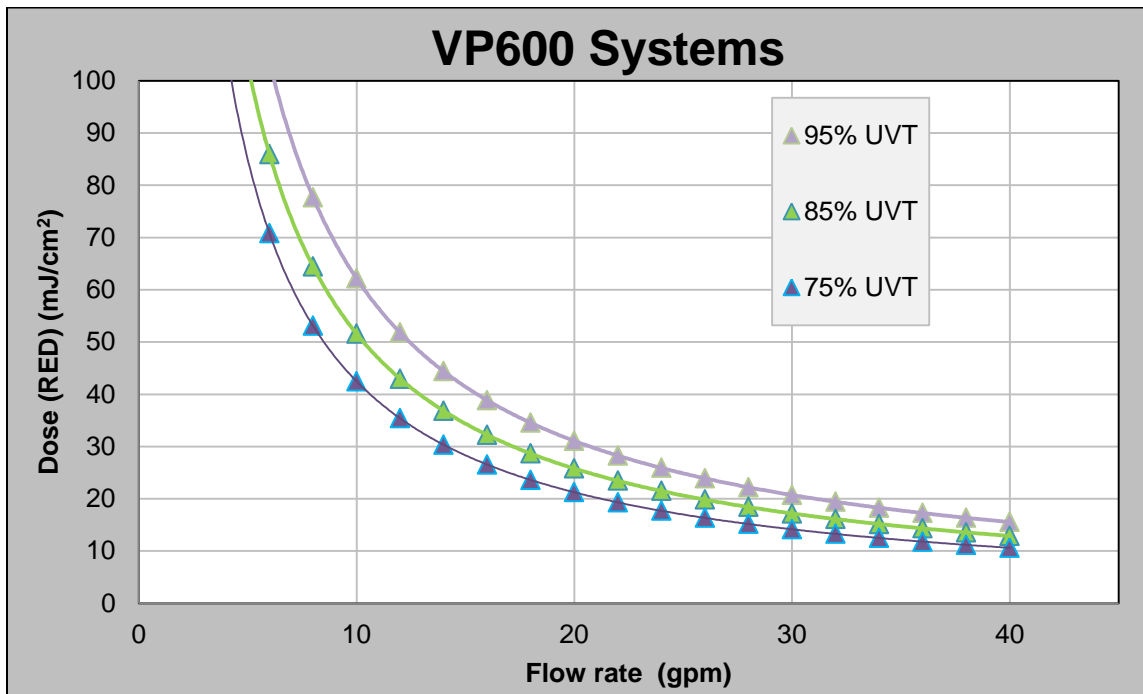
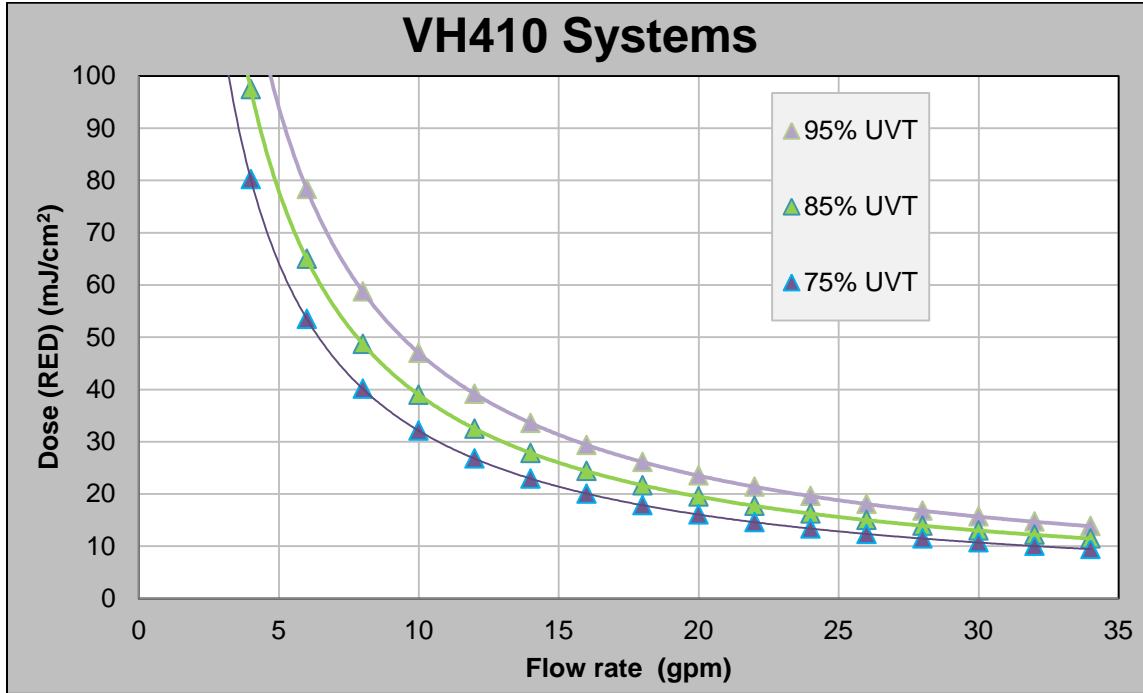
4.0 SYSTEM OVERVIEW

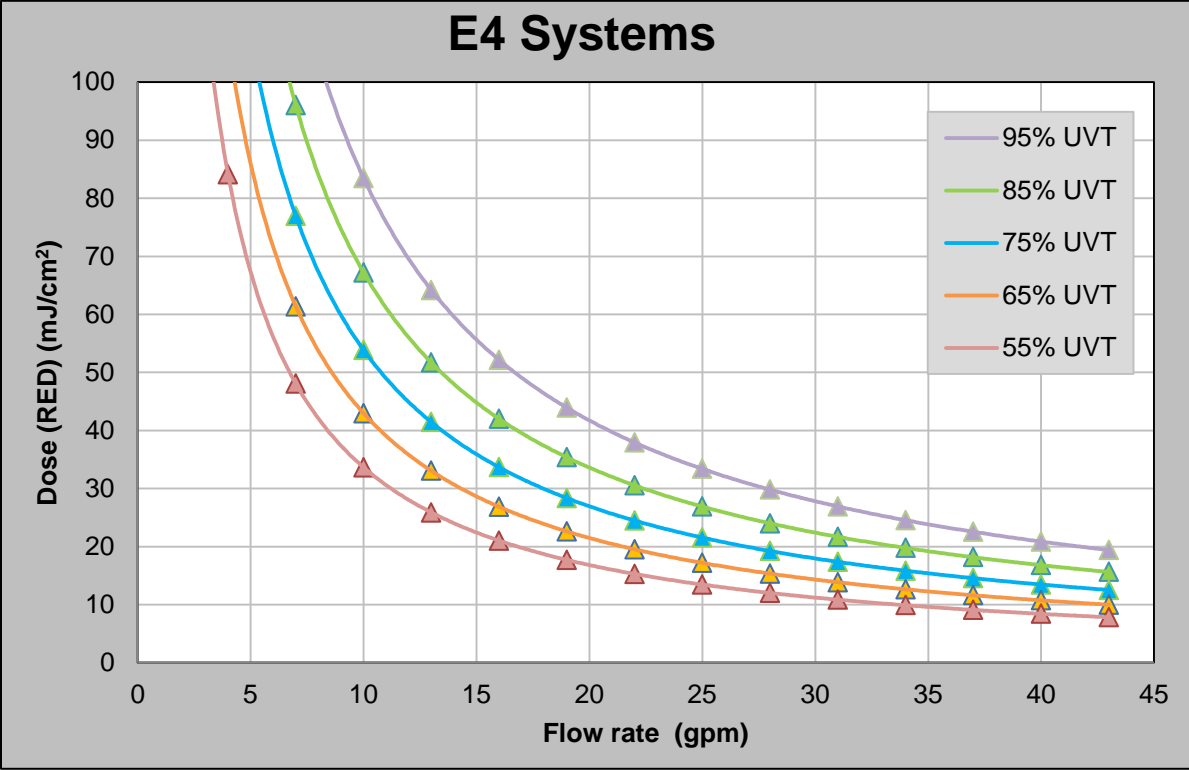
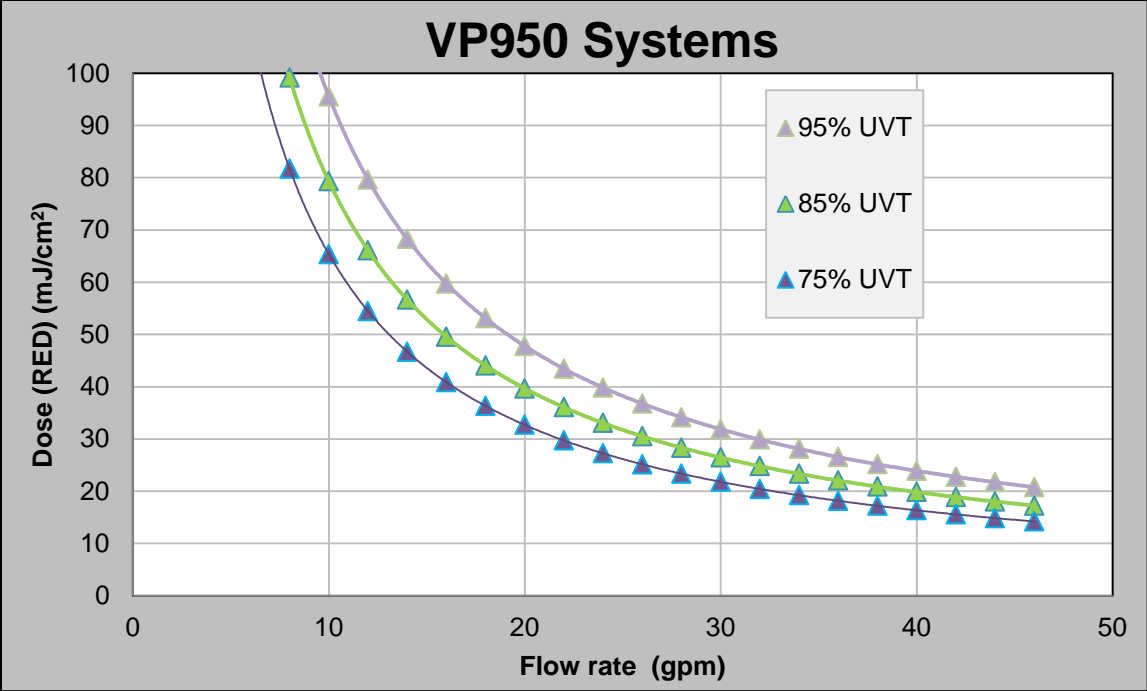
4.1 Pressure Drop

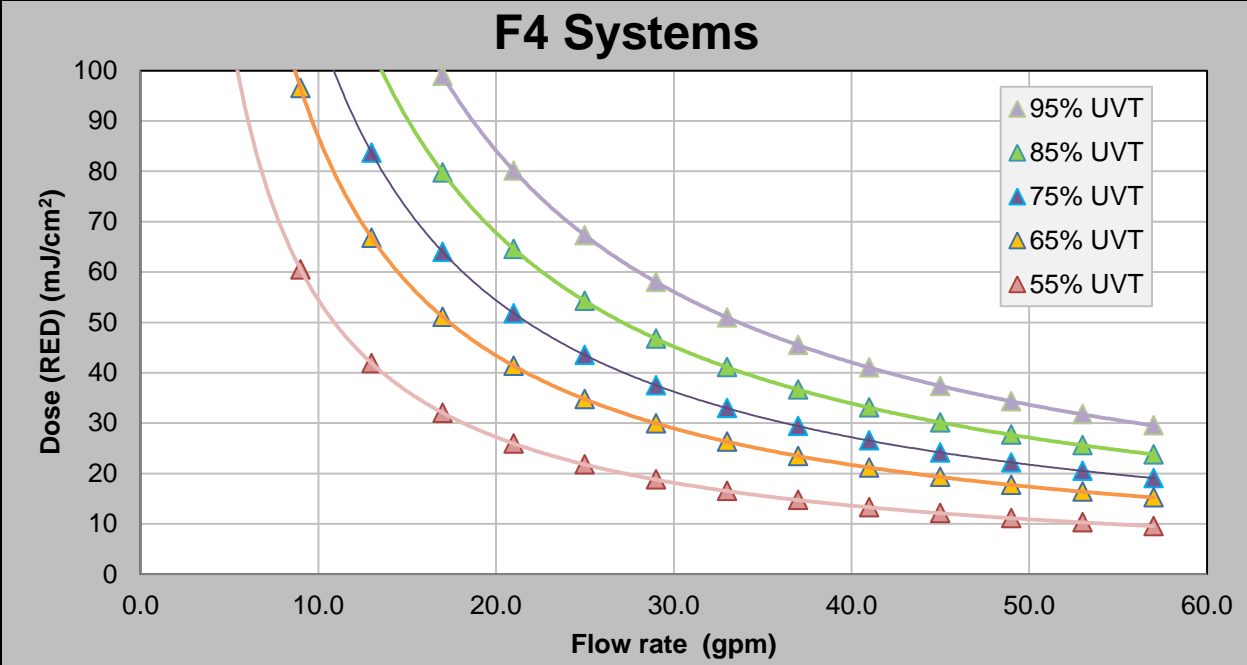


4.2 Dose Curves

Flow rate, UVT, and required UV dose conditions dictate which system is appropriate for a given location. The values in the following tables are also calculated assuming end of life lamp efficiency.







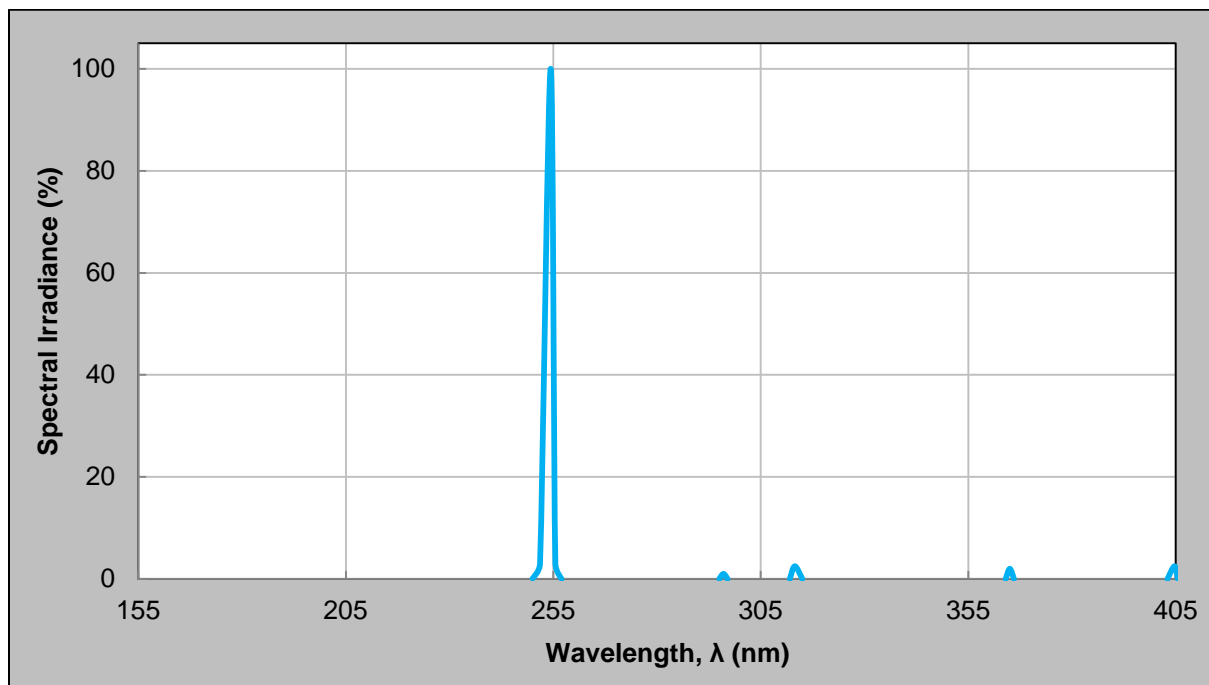
5 Key System Components

5.1 UV Lamp

5.1.1 Mercury Discharge Lamp Spectral Output

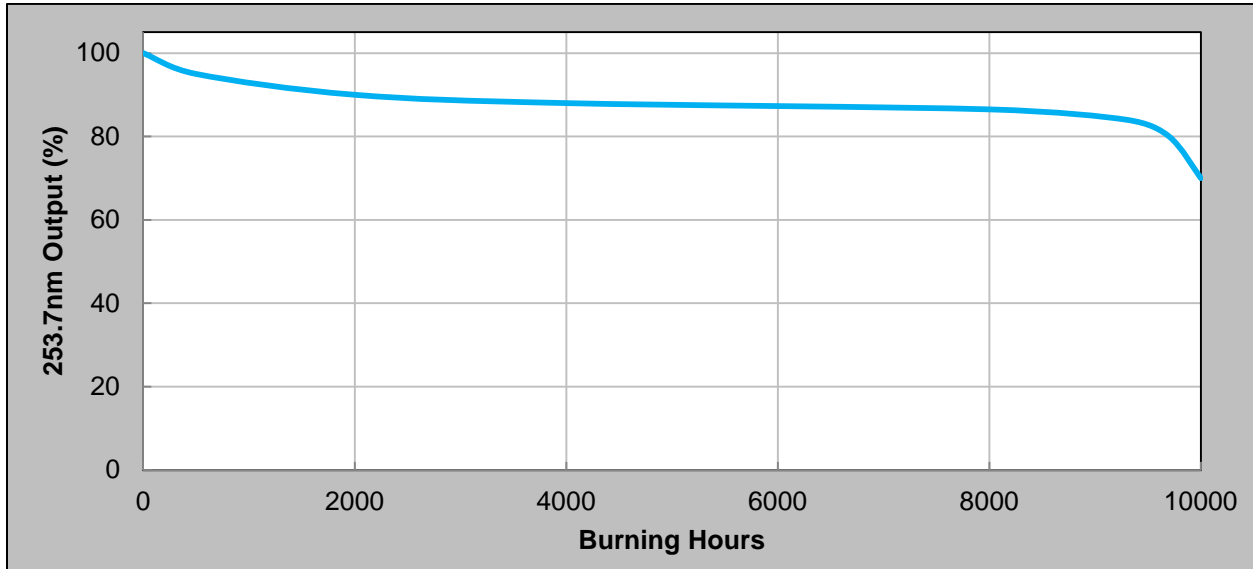
The lamp produces germicidal ultraviolet light (UV-C) at a wavelength of 253.7 nm. The absence of a peak at 185 nm is significant because it means no harmful ozone will be produced.

VIQUA's high-output lamps have a mercury content of less than 15 mg (IMERC registered).



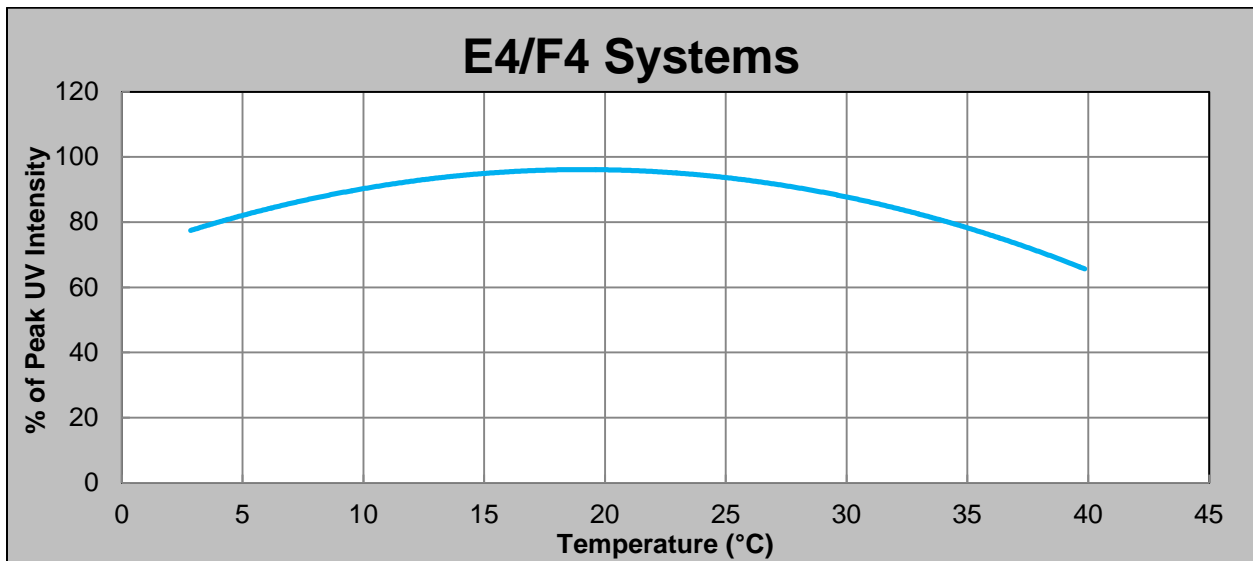
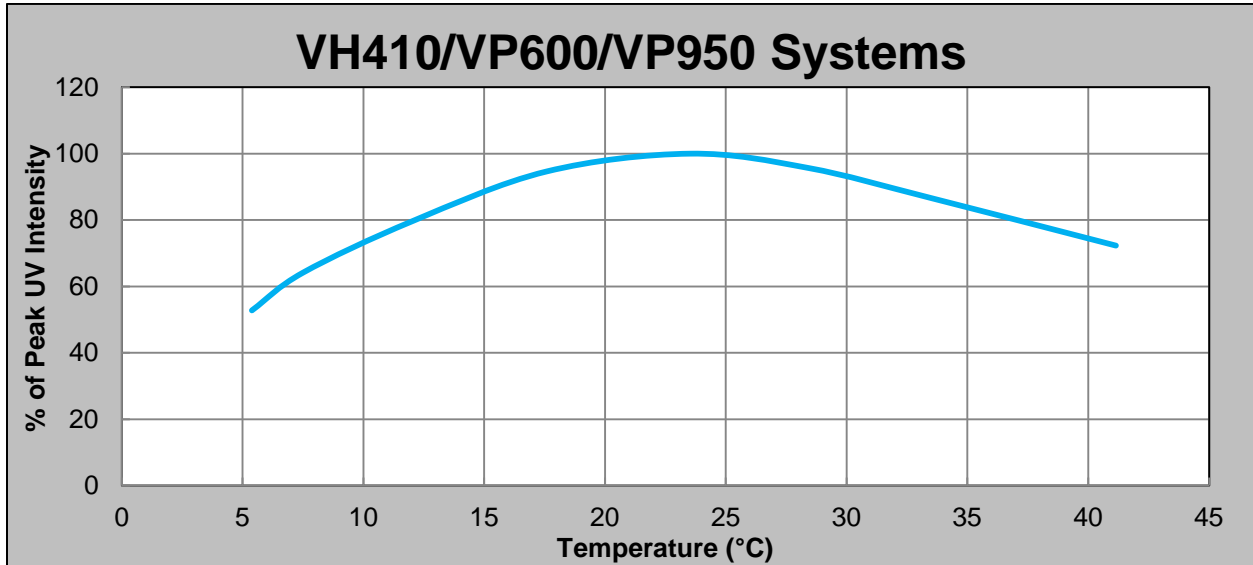
5.1.2 Degradation Chart

High-output lamps have a useful life of approximately 9,000 hours. They can provide adequate disinfection for up to one year and then require replacement.



5.1.3 Temperature Profile


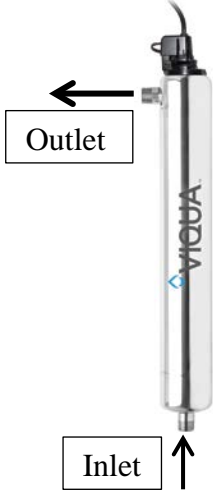
The high-output lamps provide approximately 2 times the power compared to conventional standard output lamps.



5.2 Chamber

The UV Chambers are made out of 304SS and both systems type have a different type of flow with different advantages.

5.2.1 Chamber flow comparison

VH410, VP600, and VP950 Families	E4 and F4 Families
"S shaped" port orientation for ease of installation	Axial flow maximizes the hydraulic efficiency
	

5.3 Quartz Sleeve

The UV lamp is enclosed by a quartz sleeve made of GE Type 214 or equivalent clear fused silica quartz. Overtime, mineral deposits may form on the quartz, which inhibit the amount of light that can reach the water. The sleeve must be manually cleaned on a regular basis using a mineral acid such as a calcium, lime, or rust remover. The UV lamp replacement and quartz sleeve maintenance can be accomplished without the use of tools. Ensure that the system is depressurized before performing maintenance. The sleeve design is different for each family.

5.3.1 Sleeve design comparison

VH410, VP600, and VP950 Families	E4 and F4 Families
Open ended sleeve	Domed sleeve
Retained by an o-ring and gland nut at each end	Retained with one o-ring on threaded sleeve bolt
Water in chamber must be removed for maintenance.	Don't need to remove water in chamber for maintenance but needs to be depressurized.

5.4 Controller Functionality

The controller provides to high-output lamps approximately 2 times the power compared to conventional standard output lamps. The Professional high-output controllers operate with a robust constant current of 850 mA which is approximately 2 times the power compared to standard controllers that operate at 425 mA.

5.4.1 Lamp Tracking

The digital display on each controller tracks how many days are left until the lamp must be replaced. The controller will go into alarm should the lamp not be replaced within 1 year of installment. There is a defer feature built into the system by which the end of lamp life alarm can be silenced for one week up to four times. This should be adequate time to order and install a replacement lamp.

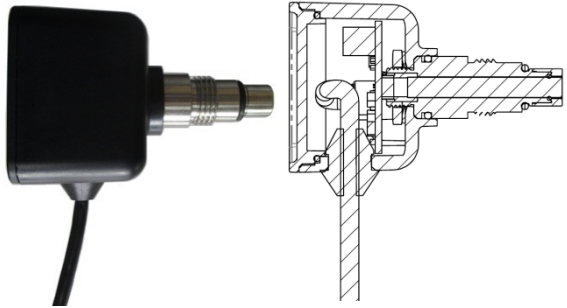
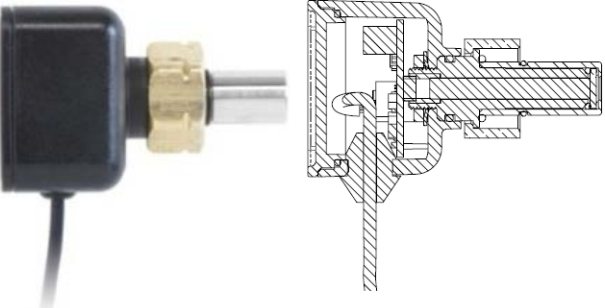
5.4.2 UV Sensor

The VH410M, VP600M, VP950M, E4+, E4-50+, E4-V+, F4+, F4-50+, and F4-V+ are all monitored systems. This means that a sensor monitors the amount of UV light reaching its position near the outer edge of the chamber.

Many factors influence a system's level of UV disinfection including water quality (primarily UVT), lamp output, and quartz sleeve fouling. Rather than base sensor alarm set-points on any one of these factors, set-points are based on the quantity of light that actually reaches the sensor. In this way, the UV sensor detects when the water is no longer being disinfected properly as a result of a change in any of the influential factors.

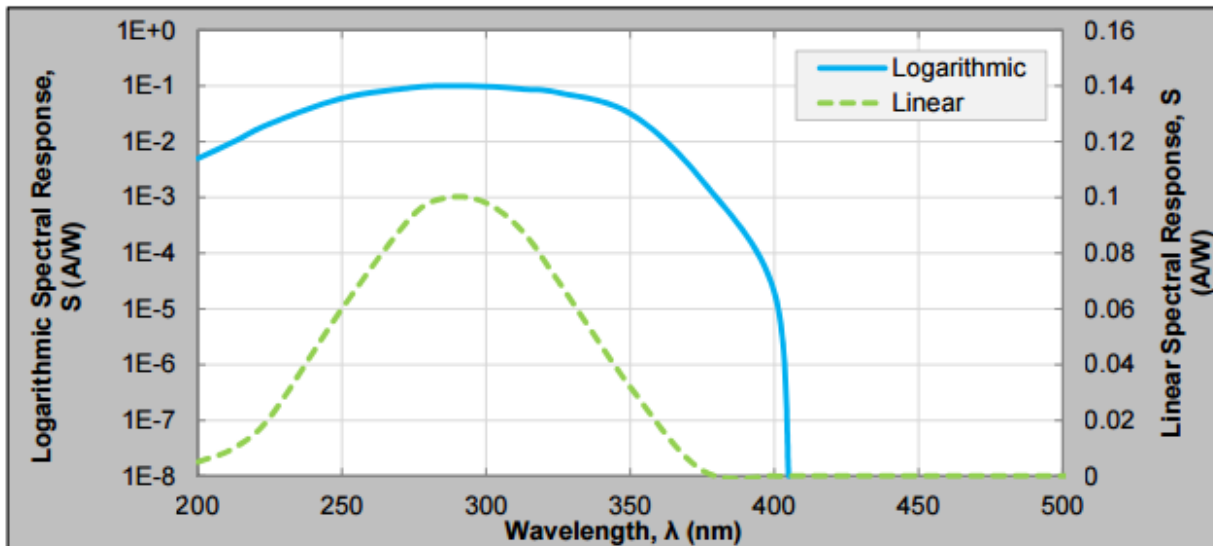
5.4.3 Features

- Factory assembled and calibrated
- UV monitored by a silicon carbide photodiode for long term stability



VH410M, VP600M, VP950M	E4+, E4-50+, E4-V+, F4+, F4-50+, and F4-V+
	
0-5 V output	4-20 mA output
No low UVT applications	50-80% low UVT model available
Internal thermistor	No temperature monitoring

5.4.4 Sensor Response Curve

The sensor's photodiode detects the emitted germicidal 253.7 nm wavelength.



5.4.5 Other Controller Features

VH410, VP600, and VP950 Families	E4 and F4 Families
 <p>The image shows a rectangular electronic controller with a white label. The label contains technical specifications, safety warnings, and the VIQUA logo. The controller has a black cable on the left side.</p>	 <p>The image shows a black rectangular controller with a small LED display screen on the front. The screen displays '365 Days' and 'Remaining'. The VIQUA logo is visible on the right side of the device. Two black cables are attached to the bottom.</p>
4 character display screen	LED display screen
Displays alarm symbols	Full alarm descriptions and helpful tips
Tracks and displays number of days controller in operation	
Replacement lamp counter reset	
Lamp securement feature	
MOV for voltage spike protection and immunity to electrical interference	
Isolated lamp driving chip for lamp and ballast protection	
Isolated alarm circuit for maintained audible alarm functionality despite a blown driver	Low rated secondary fuse on driver chip to maintain audible alarm despite blown driver
Display circuit isolated from high voltage	
Power factor correction reduces harmonics which can cause interference	
Constant current	
EMC for noise prevention and irradiance emission compliance	
CE standard EN 55014-1 compliant	

6 Additional Optional Features

6.1 NSF Validated Systems

VIQUA's professional high output product line includes 4 NSF class B validated products: E4-V, E4-V+, F4-V, and F4-V+.

Benefits

- Monitored and non-monitored system availability to suit user preference and regional regulation
- Ideal for regulated markets

6.2 Integrated Home Systems

There are 2 integrated home systems included in the professional high output product line: VH410-F20 and IHS22-E4. These systems include unique housing structures to combine 5 micron sediment filtration with UV disinfection.

Benefits

- Captures the clarification benefits of filtration with the disinfection benefits of UV light
- Improves UV dose by improving water quality as compared to systems without pre-treatment
- Simplifies installation



Model	VH410-F20	IHS22-E4
Quantity		
Chamber		
Dimensions	17" x 10½" x 28" (43 cm x 26 cm x 45 cm)	25" x 12" x 36 ½" (63.5 cm x 30.5 cm x 92.9 cm)
Distance between Mounting Bracket Holes	13" (33 cm)	16" (40.6 cm)
Inlet ports	¾" FNPT	1" FNPT
Outlet ports	1" MNPT x ¾" FNPT	1" MNPT
Operating Pressure	15 - 100 psi (103 - 689 kPa)	4 - 100 psi (27.5 - 689 kPa)
Ambient air temp.	2°C (36°F) - 40°C (104°F)	2°C (36°F) - 50°C (122°F)
Ambient water temp.	2°C (36°F) - 40°C (104°F)	
*Hardness	< 7 gpg (120 mg/L)	
*Manganese content	< 0.05 ppm (0.05 mg/L)	
*Iron content	< 0.3 ppm (0.3 mg/L)	
*UVT	> 75%	
*Turbidity	< 1 NTU	
Orientation	Vertical	
Electrical		
Voltage	100-240 V	
Frequency	50-60 Hz	
Max. current	1.5 Amps	1 Amp
Max. power consumption	60 W	83 W
Lamp power	45 W	70 W

6.3 Low UVT Applications

There are two low UVT systems available in VIQUA's professional high output line: E4-50+ and F4-50+. These systems use the same style of sensor as other E4 and F4 systems but 50+ system sensors are calibrated in such a way that the system will monitor low UVT water without going into alarm. The sensor will still monitor for proper UV dosage; if UVT drops below 50% or some other factor impacts UV dose (lamp age, sleeve fouling, ect.) the system will still go into alarm.

6.4 Flow management fittings

6.4.1 Solenoid Valve

In addition to a sensor, a solenoid valve may be included at the outlet port of monitored systems. The solenoid valve will only remain open while it receives AC power. When the sensor reads that water is not being properly disinfected, it sends the controller into alarm and opens the internal relay of the solenoid valve, cutting off power and closing the valve. The valve will remain closed until the sensor reads that the UV intensity is greater than 49%.

Including a solenoid valve in the system provides an extra layer of defense to ensure that only properly treated water is allowed to pass beyond the system. The operation of the solenoid can be temporarily disabled for up to 12 hours if necessary.

6.4.2 Temperature Management Valve

A temperature management valve can be added to any high output system. Water sitting stagnant in a chamber experiences prolonged exposure to UV light. While this means the water will undergo a higher disinfecting dose, it also means the water has more time to absorb the heat coming off of the UV lamp. Heat causes metal within the temperature management valve to expand. At about 57°C (135°F) the valve reaches critical temperature and trips so that the flow is diverted to an alternative line. This line should connect to some drain or basin so that overheated water can be safely collected.

6.4.3 Flow Restrictor

Flow restrictors can be used on any high output system to limit flow and maintain proper dose requirements. There are no flow meters or flow monitoring systems for professional high output units so the user will have no indication of whether flow limits have been exceeded and therefore if UV dose has not been achieved. A flow restrictor ensures that this is not possible. Flow restrictors should be installed on the outlet port of the system.

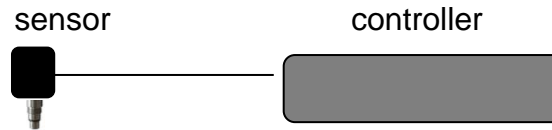
Maximum Flow (GPM)	Pipe Diameter (in.)
1.5	½
2.5	½
3.5	½
4.3	¾
6.0	¾
6.0	1
8.0	1
8.9	¾
10	¾
12	1
15	1
15.8	1
20	1
26.1	1

6.5 Remote Capabilities

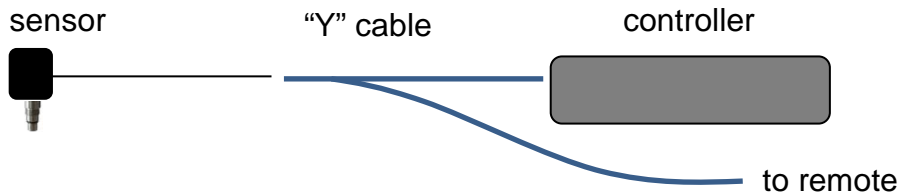
4-20mA Output (VH410, VP600, and VP950 systems)

An optional “Y” cable is available to transmit the 4-20 mA signal output by the UV sensor to a remote location. The “Y” cable is 20 metres (60 feet) in length.

Typical connection:



Connection with “Y” cable:



4-20mA Output (E4 and F4 systems)

An optional 4-20 mA interface allows the user to read the current output by the UV sensor or the flow meter. The interface can be used to send information to other monitoring systems.



Dry Contacts (E4 and F4 systems)

The dry contact can be used to signal a remote device in event of the following major alarms:

- Lamp Fault
- Ballast (Controller) Fault
- UV Sensor Fault
- Low UV Fault

6.6 Connection Logic Chart

Wire	Output Terminal	UV System in Normal Operation	UV System in Major alarm/not powered on
RED	N.O. (Normally Open Contact)	The Electrical path between these contacts are closed	The Electrical path between these contacts are open
BLACK	COM. (Common)		
	COM. (Common)	The Electrical path between these contacts are open	The Electrical path between these contacts are closed
GREEN	N.C. (Normally Closed Contact)		

7 CERTIFICATIONS

All professional high output systems are tested and certified to UL, CE, RoHS, and Low Lead standards.



8 WARRANTY

VIQUA warrants the system components to be free from defects in material and workmanship for the time specified in the table below. During this time, VIQUA will repair or replace, at its option, any defective parts covered by the warranty.

Component	Warranty
UV Chamber	ten (10) years from the date of purchase
Electrical (controller) and Hardware Components	three (3) years from the date of purchase
UV Lamps, Sleeves, and UV Sensors	one (1) year from the date of purchase



VIQUA DECLARATION

VIQUA is a sustainable business that designs and builds industry-leading UV systems. Our products are used worldwide in applications that help improve quality of life.

VIQUA utilizes quality materials and processes to ensure each product meets safety, health and environmental protection requirements. VIQUA's product development process ensures comprehensive product validation and certification.

VIQUA manufactures each UV disinfection system to the highest quality standards. Each system is subjected to rigorous functional testing prior to shipment to guarantee proper operation.

VIQUA is an ISO9001:2008 registered company.

Julian Giggs
Director of Product Development & Engineering
VIQUA

425 Clair Rd. W, Guelph, Ontario, Canada N1L 1R1
Tel: (+1) 519-763-1032 • Toll Free: (+1) 800-265-7246 (US and Canada)
Tel: (+31) 73 747 0144 (Europe) • Fax: (+1) 519-763-5069
E-mail: info@viqua.com
www.viqua.com