Memo

To: Paul Clow

From: Dave McKenna

cc: Sarah Collins

Date: October 31, 2021

Subject: Overview of Mobile Water Treatment Plant

Our File: File # 21-1618

Introduction

This technical memorandum provides a description of the Mobile Water Treatment Plant (MWTP) fabricated for the Government of Nunavut. The plant was fabricated by Canadian Water Technologies (CWT) in Calgary, Alberta, and was shipped to Iqaluit in October 2021, for use as a temporary water treatment system for Nunavut communities. The information includes a description of the treatment process and major equipment, drawings including P&IDs, mechanical drawings, and layout drawings.

A description of the operational sampling plan, and environmental management plans are also included.

Treatment Process

The MWTP process includes two distinct containers. Container No.1 includes filtration and disinfection equipment suitable for treatment of surface water, with a truck fill station; container No.2 includes an RO system suitable for treatment of seawater. For deployment at Iqaluit, it is proposed to deploy only container No.1 for the treatment of surface water from Geraldine Lake.

The treatment process for Container No.1 includes the following:

- An intake pump connected to Container No.1 by an insulated and heat traced forcemain
- The forcemain will supported by a by a modular dock system from the shoreline, and the intake pump will be suspended from the end of the dock.
- Raw water entering Container No.1 will be increased in pressure with inline booster pumps
- Optional injection of coagulant and hypochlorite (raw water chlorination would not be used for this application)
- Two-stage auto-backwash strainers (40 + 20 micron)
- Two-stage cartridge filtration (10 + 5 micron)
- UV disinfection
- Chlorination
- On-line turbidimeter
- Treated water storage tank
- Truck fill pump

- Truck fill arm

A process and instrumentation drawing from CWT for Container No.1 is attached to this memo.

Chemical injection systems in Container No.1 include pre-chlorination, coagulation, and treated water chlorination. The pre-chlorination chemical feed is intended for operation with Container No.2, for biological fouling control of the reverse osmosis membranes. The pre-chlorination chemical feed system will not be required for deployment at Iqaluit, since the RO system (Container No.2) will not be used, and the backwash from the inlet auto-backwash strainers will not contain any forms of chlorine. If required, the pre-chlorination chemical feed can be disabled by disconnecting the chemical injection line from the inlet water pipe as a safety measure.

Equipment

Vendor specifications and information for the major equipment included in Container No.1 is attached to this memo. Included is information for:

- Intake pump
- Booster pump
- Auto backwash strainers
- Cartridge filtration
- UV Reactors
- Truck fill pump

Site layout and Drawings

The proposed location for the MWTP at Iqaluit is shown in the attached site plan. The site will require some initial preparation to provide a level base for Container No.1, and truck access. The proposed location is in a cove on Geraldine Lake south of the dam and intake for the Iqaluit water treatment plant. Power supply is being coordinated with QEC. Truck access is required for water trucks, and periodic removal of backwash waste from storage tanks by vacuum truck.

The intake forcemain will be routed overland to a temporary floating dock projecting into the Lake, from which the intake pump will be suspended.

Drawings are also attached showing the plan and sections of Container No.1, and the exterior views of Container No.1 and the truck fill arm.

Operational Sampling/Monitoring Plan

The proposed sampling and monitoring plan for the MWTP will include the following:

- Raw water turbidity (daily grab)
- Treated water turbidity (daily grab)

- Residual free chlorine (daily grab from truck fill)

The plant is provided with an on-line turbidimeter downstream of filtration, and a free chlorine analyzer downstream of the treated water storage tank. The UV system includes UV intensity sensors and alarms on each reactor, to alert operators when lamp sleeves must be cleaned.

Environmental Management Plan

The environmental management plan for the operation of the MWTP includes spill management, and waste disposal.

There is no diesel generator at this time for operation of the MWTP, and power will be provided from the grid by QEC. Therefore there is no risk of diesel spills.

The capacity of chemical tanks at the MWTP are relatively small, and any spills will be contained within the building and readily observed by operators for clean-up. Operators will shut down the MWTP in the event of a chemical leak (hypochlorite solution or coagulant), and make supervisors aware of the situation, and need for clean-up. Bulk storage of chemicals will be at the Iqaluit water treatment plant, and operators will periodically take delivery of small quantities of chemical to replenish chemical feed tanks.

Waste streams generated from the operation of Container No.1 include spent cartridge filters, and backwash from the auto-backwash strainers.

- The cartridge filters will periodically need to be replaced once they become plugged with solids, and replaced with fresh cartridges. The plugged filter cartridges will be sent to disposal at the landfill.
- The strainers are expected to produce less than 1 percent waste based on the inlet flow rate; however, this backwash rate is dependent on source water quality, and will be established during commissioning. For 24-hour operation, up to 6 m^3 of backwash could be generated per day. Backwash waste from the strainer will consist of the debris retained on the strainer surface, and the raw water used to flush the accumulated debris off the screen. This backwash stream is considered non-hazardous, with the same chemical composition as the lake water, and does not contain any chemicals from water treatment. This waste stream would be discharged back to the lake.

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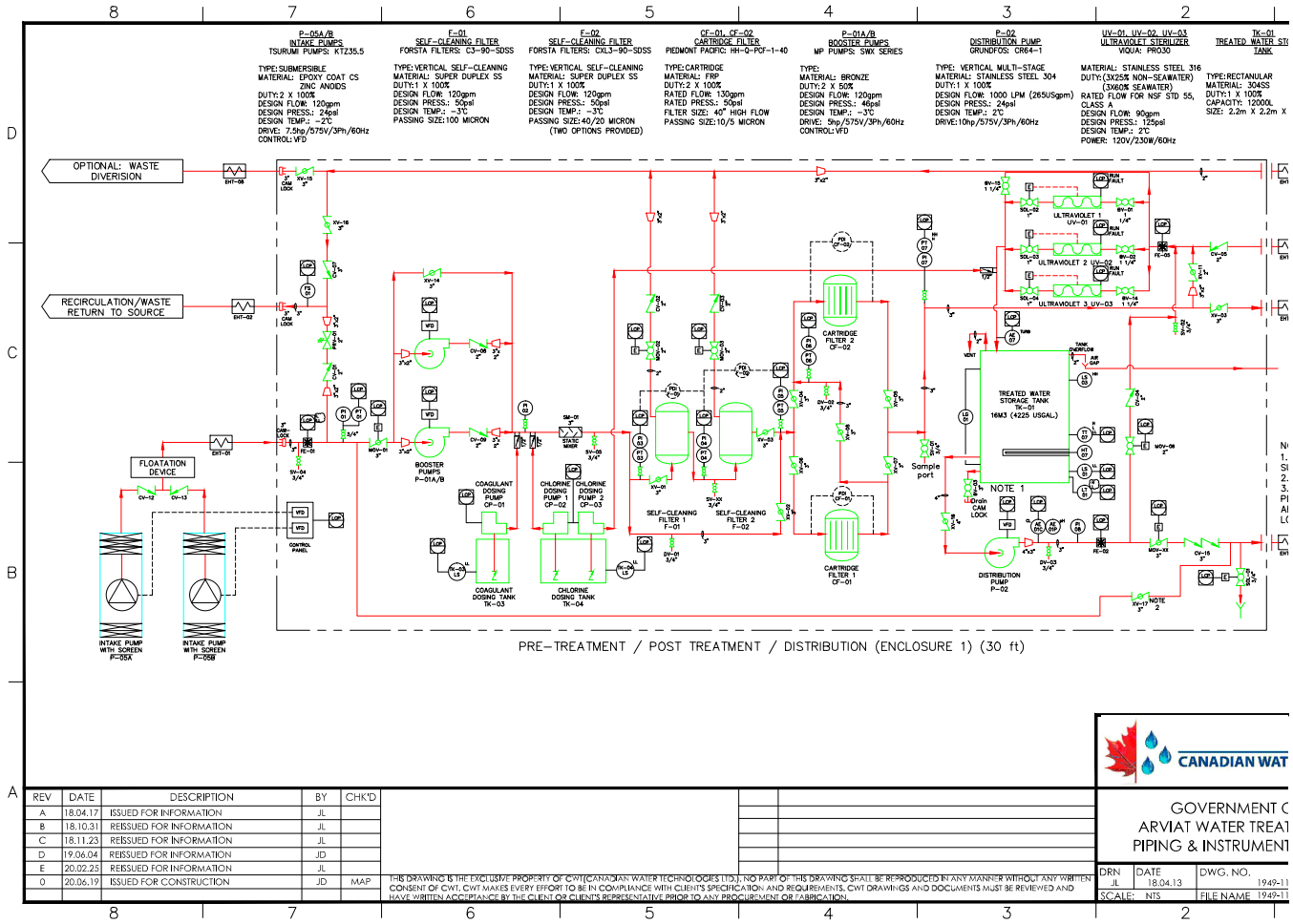
Sincerely,

Dillon Consulting Limited

Dave McKenna, P.Eng.
Project Manager, Partner
506-633-5000 x5416
dmckenna@dillon.ca

Drawings



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B	18.10.31	REISSUED FOR INFORMATION	JL	
C	18.11.23	REISSUED FOR INFORMATION	JL	
D	19.06.04	REISSUED FOR INFORMATION	JD	
E	20.02.25	REISSUED FOR INFORMATION	JL	
0	20.06.19	ISSUED FOR CONSTRUCTION	JD	MAP

CANADIAN WAT

GOVERNMENT C
ARVIAT WATER TREAT
PIPING & INSTRUMENT

DRN	DATE	DWG. NO.
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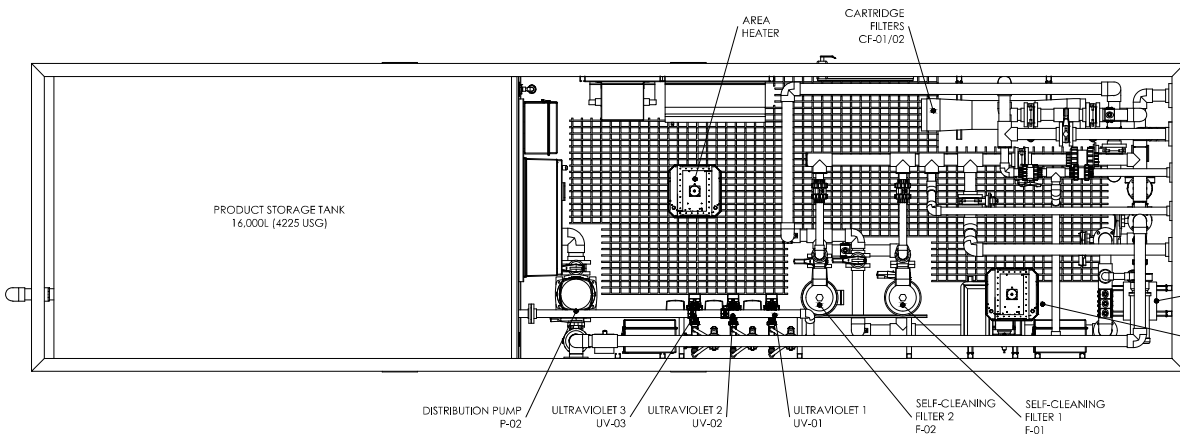

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C	19.02.20	REISSUED FOR INFORMATION	JL	
D	20.02.25	REISSUED FOR INFORMATION	JL	MP
0	20.06.30	ISSUED FOR CONSTRUCTION	JL	

CANADIAN WAT

GOVERNMENT C
EMERGENCY WATER TRI
CONTAINER 1 EQUI

DRN	DATE	DWG. NO.
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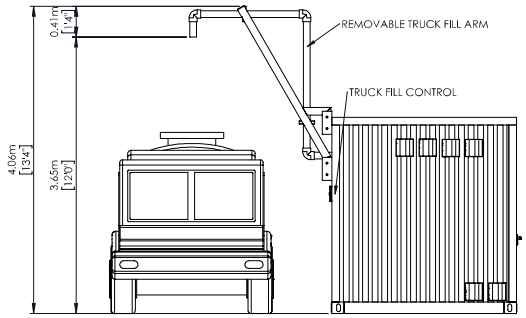
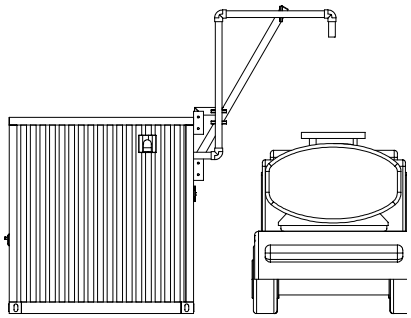
SCALE: NTS		FILE NAME 1949-61



ELEVATION VIEW - REAR



ELEVATION VIEW - FRONT

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B	20.02.25	ISSUED FOR INFORMATION	JL	MP
0	20.06.30	ISSUED FOR INFORMATION	JL	

NOTES:

CANADIAN WAT

GOVERNMENT (
EMERGENCY WATER TR
FRESH WATE

DRN	DATE	DWG. NO.
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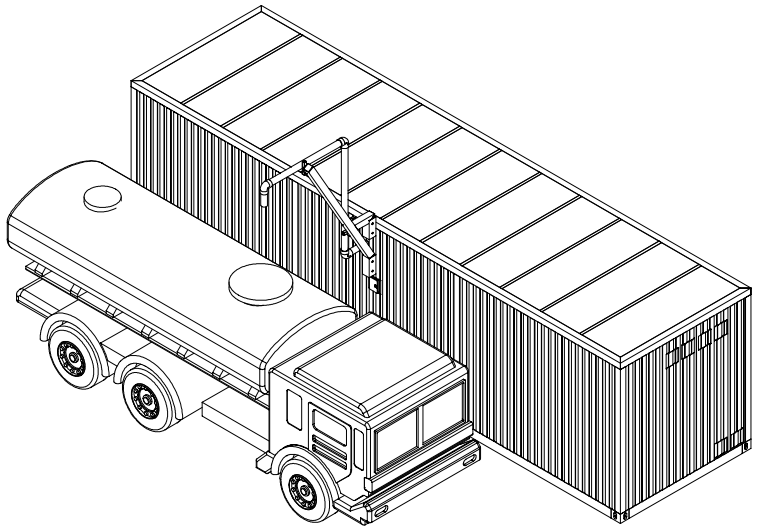
SCALE:	NTS	FILE NAME 1949-2



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B	20.02.25	ISSUED FOR INFORMATION	JL	MP
0	20.06.30	ISSUED FOR INFORMATION	JL	

NOTES:

CANADIAN WAT

GOVERNMENT (
EMERGENCY WATER TR
FRESH WATEI

DRN	DATE	DWG. NO.
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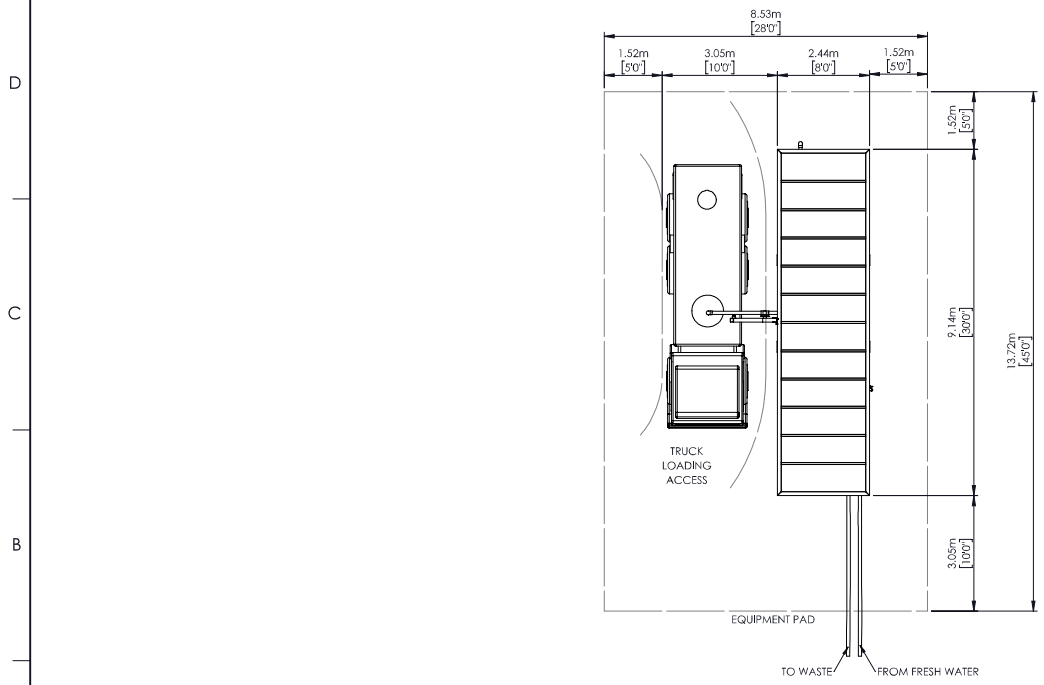
SCALE:	NTS	FILE NAME 1949-2



CANADIAN WAT

REV	DATE	DESCRIPTION	BY	CHK'D
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B	20.02.25	ISSUED FOR INFORMATION	JL	MP
0	20.06.30	ISSUED FOR INFORMATION	JL	

NOTES:

GOVERNMENT (
EMERGENCY WATER TR
FRESH WATEI

DRN	DATE	DWG. NO.
JL	19.01.11	1949-2
SCALE:	NTS	FILE NAME 1949-2

OVERALL SITEPLAN

SCALE: NOT TO SCALE

Intake Pumps

DILLON CONSULTING

P-05 - Sea Water Intake Pump

Oct. 11

60-PC-KTZ-08

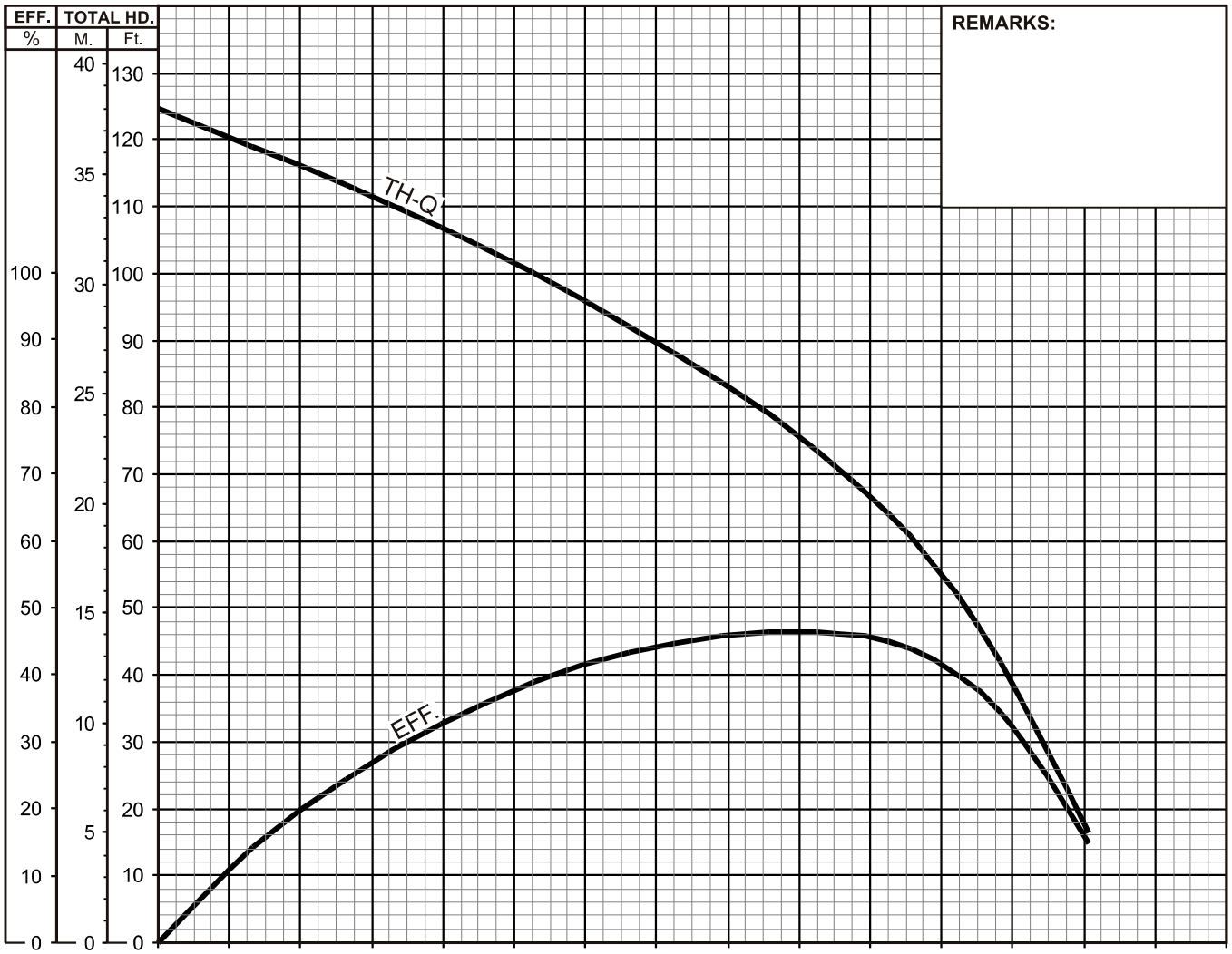
TSURUMI PUMP | **KTZ - SERIES** DEWATERING PUMPS | **PERFORMANCE CURVE**

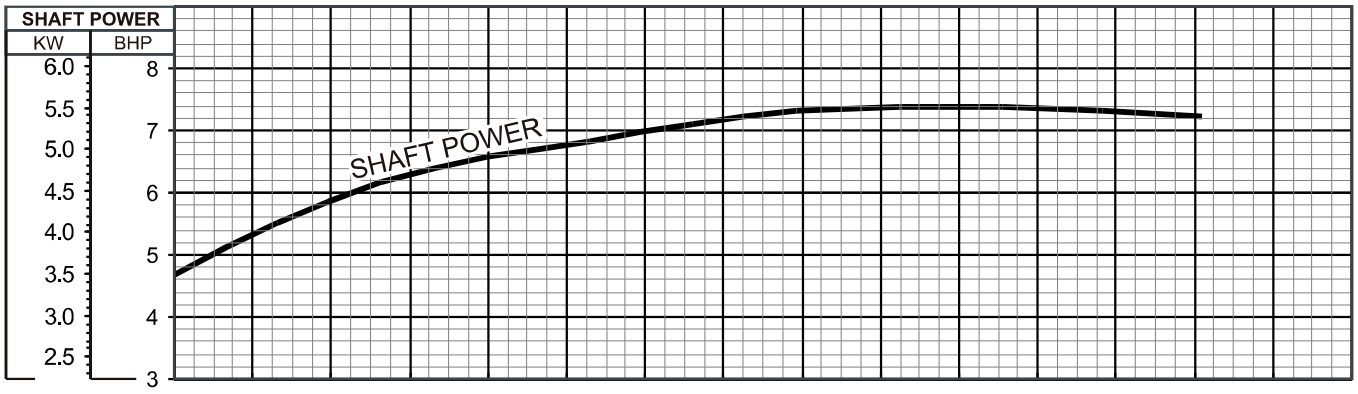
MODEL	BORE	HP	KW	RPM	SOLIDS DIA	LIQUID	SG.	VISCOSITY	TEMP.
KTZ35.5-61	3"/80mm	7.5	5.5	3545	0.334"/8.5mm	Water	1.0	1.123 cSt.	60°F

PUMP TYPE	PHASE	VOLTAGE	AMPERAGE	HZ	STARTING METHOD	INS. CLASS
Dewatering Pump	3	208-230/460/575	21.0 - 20.0 / 10.0 / 7.9	60	Direct On Line	F

CURVE No.	DATE	PHASE	VOLTAGE	AMPERAGE	HZ	STARTING METHOD	INS. CLASS
-	-	-	-	-	-	-	-

REMARKS:





TSURUMI PUMP
www.tsurumi-global.com

KTZ/KTD

DEWATERING PUMPS

We Are Original

Submersible Heavy-duty Dewatering Pumps

The KTZ-series is Tsurumi's flagship line of submersible pumps. Made with a cast iron body and high chromium cast iron impeller, the pumps can withstand the most demanding conditions found in construction, aggregate and mining applications. Versatility is increased as each model has the capability of being easily converted between high head and high volume performance with a simple change of impeller, suction cover and hose coupling.

Dual silicon carbide mechanical seals are isolated in the oil chamber to protect the seal faces against abrasion and corrosion. In addition, the seals are enclosed in Tsurumi's patented Oil Lifter to ensure reliable lubrication and cooling. This design exceeds the standard configuration of competitors and offers a longer mechanical seal life for a more reliable pump.
Pumps with a 7.5 or 11kW motor incorporate seal pressure relief ports, therefore mechanical seals are exposed only to the pressure developed by the sump submergence level. This virtually eliminates the premature wear and failure of mechanical seals in higher pressure applications.

The KTZE-series is an automatic pump without cumbersome floats. An innovative electrode type relay unit built into the pump automatically starts and stops the pump to eliminate dry-running. This mechanism greatly reduces power consumption and extends operating life.

The KTD-series is a submersible heavy-duty slurry pump utilizing the KTZ-series as the base. It is designed to have more motor shaft power allowance than the KTZ to handle muddy water with higher specific gravities. An agitator suspends solids to assist in pumping sediments in combination with a dedicated strainer. This pump is suitable for transferring or draining bentonite slurry.

Available as optional specifications are a proprietary "seawater-resistant pump" developed over many years by Tsurumi to enable seawater intake/drainage for long periods of time, and an "all stainless steel pump" using 316 stainless steel for mining markets.

Registration of Design

Tsurumi has registered the design of the KTZ-series in major countries.
Design rights are granted under the laws of each country.

KTZ: Tsurumi's flagship line of heavy-duty drainage pumps

KTZE: Automatic drainage pumps with an innovative electrode type relay unit

KTD: Slurry pumps that deliver powerful agitation for discharging slurries laden with silt, earth, sand or other particulate

Selection Table

Motor Output		1.5kW	2-2.2kW	3-3.7kW	5.5kW	7.5kW	11kW
KTZ	2" 50mm	■	■	■			
	3" 80mm	■	■	■	■		
	4" 100mm			■	■	■	■
	6" 150mm					■	■
KTZE -Automatic-	2" 50mm	■	■	■			
	3" 80mm	■	■	■			
	4" 100mm			■			
KTD -Slurry-	2" 50mm		■				
	3" 80mm			■			

Model Number Designation

Name of the series — KTZ

Operation sub code — E : Automatic opration; None : Non-automatic operation

Discharge bore in inches — 4

Rated motor output in kilowatts — 3.7

KTZ E 4 3.7

Options

☑ Seawater-resistant version;	Galvanic anode & Special impeller
☑ High temperature liquids version;	Max. 90°C
☑ High voltage version;	Max. 1000V
☑ All stainless steel version;	316 S.S.

☑ Seawater-Resistant Version

Tsurumi's pumps can be combined with a seawater-resistant kit (optional) that adds a "galvanic anode" and "seawater-resistant special cast iron impeller," and enables about two years of service. (The service period depends on operating conditions.) For details, refer to the Seawater-Resistant Pumps catalog [IB115].

Conversion to Seawater-Resistant Pump

☑ High Temperature Liquids Version

Tsurumi's pumps are applicable to high temperature liquids of up to 90°C. Pumps of the standard specification can discharge liquids of up to 40°C. However, there are many fields that need to discharge higher temperature liquids, e.g., discharging industrial water from a power plant or ironworks, or discharging hot spring water from a mine in a volcanic zone.

☑ High Voltage Version

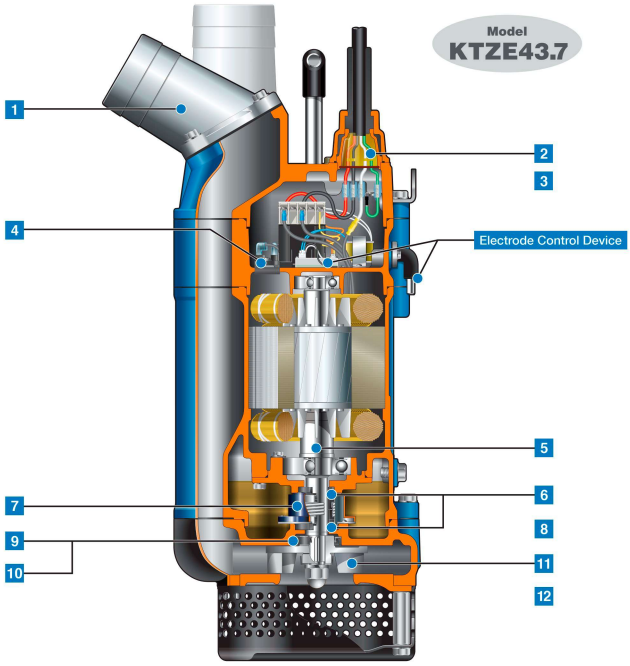
Tsurumi's pumps can be fabricated to 690V or 1000V ratings that are often required for mining applications. The pumps meet mining safety standards as they come with shielded cables and motors with built-in diodes for ground-fault checks.

☑ All Stainless Steel Version

All of the parts of Tsurumi's pumps that contact fluid, including the impeller, pump casing, motor frame, strainer stand, and hose coupling, can be made in 316 stainless steel. Tsurumi's all stainless steel pump can handle corrosive fluids generated in mines or quarries, and chemical fluids of low pH value.

Top Discharge, Side Flow Design

This design assures efficient motor cooling even if the pump runs with its motor exposed to air, and also allows the overall diameter of the pump to be reduced for installation in confined spaces.



Electrode Control Device (KTZE)
Consisting of an electric probe and relay unit, this enables automatic operation, reduces power consumption and extends operating life.

1 **Multi-directional Hose Coupling** (KTZ & KTZE)
Can be configured for inclined or vertical discharge, allowing for smoother installation.

2 **Anti-wicking Cable Entry**
Prevents water incursion due to capillary wicking should the power cable be damaged or the end submerged.

3 **Cable Clip**
Prevents unexpected water incursion that can occur if the cable is damaged, by protecting the cable against the tugging and rough handling found at construction sites.

4 **Circle Thermal Protector**
Directly cuts the motor circuit if excessive heat builds up or overcurrent occurs in the motor.

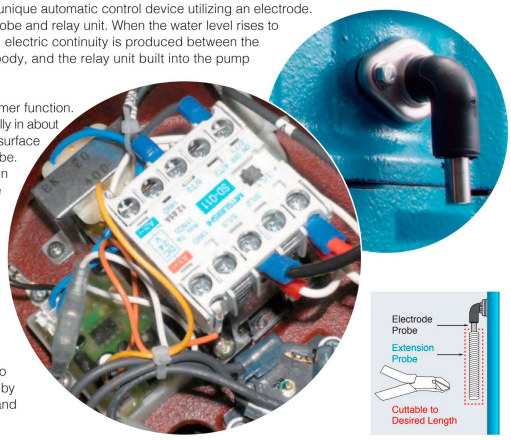
5 **Shaft**
Quenching treatment is applied to parts that contact particles in pumped fluids and whose mechanical seal may wear out, to enhance surface hardness and extend shaft service life.

40 % Reduction in Power Consumption

Electrode Control Device

Tsurumi has developed a unique automatic control device utilizing an electrode. It consists of an electric probe and relay unit. When the water level rises to contact the electric probe, electric continuity is produced between the electrode and the pump body, and the relay unit built into the pump turns on the pump.

The relay unit includes a timer function. The pump stops automatically in about one minute after the water surface falls below the electric probe. If the water level rises again to contact the electric probe within the run time, the pump continues to run for one more minute.



Since this mechanism eliminates dry-running, the pump can reduce power consumption by up to 40 percent compared with non-automatic pumps (Tsurumi comparison). It also prevents chattering caused by a turbulent water surface and extends operating life.

It is possible to set a lower starting water level by using an extension probe (optional accessory). The starting water level is adjustable because the extension probe can be cut to the desired length as it is made of coil spring.

6 **Dual Inside Mechanical Seals with Silicon Carbide Faces**
Isolated in the oil chamber where a clean, non-corrosive and abrasion-free lubricating environment is maintained. Compared with the water-cooled outside mechanical seal, it reduces the risk of failure caused by dry-heating and adhering matter. The silicon carbide provides 5 times higher corrosion, wear and heat resistance than the tungsten carbide. Rubber parts of the upper and lower fixing rings are made of NBR or FPM (FKM), which provides higher resistance to heat and chemicals.

7 **Oil Lifter [Patented]**
Provides lubrication and cooling of the seal faces down to 1/3 of normal oil level, thus maintaining a stable shaft sealing effect and prolonging seal life longer.

8 **Seal Pressure Relief Ports** (7.5kW and above)
Protect the mechanical seal from pump pressure. They also protect the seal face by discharging wear particles.

9 **Oil Seal** (5.5kW and below)
Used as a "Dust Seal", it protects the mechanical seal from abrasive particles.

10 **Labyrinth Ring** (7.5kW and above)
Equipped to provide a better countermeasure against wear caused by high pressure generated in the casing and improve the maintainability.

11 **High-chromium Cast Iron Semi-open Impeller**
Resists wear caused by abrasive particles and enables the pump to maintain its original performance for an extended period of time.

12 **Agitating Mechanism** (KTD)
Consists of a shaft-mounted agitator and a dedicated strainer. The agitator made of high-chromium cast iron resists wear caused by abrasive particles, and it suspends solids to assist in pumping sediments in combination with the strainer.

KTZ –Flagship Line–

The KTZ-series is a submersible three-phase cast iron high head heavy-duty drainage pump. The cast iron body with high-chromium cast iron impeller enables it to withstand demanding conditions found in construction, aggregate and mining applications. The top discharge, side flow design assures efficient motor cooling even when it operates with its motor exposed to air. The slim design allows the pump to be placed in a confined space. The discharge direction is selectable between vertical and inclined, which prevents folding or bending of the discharge hose. The pump with 7.5 or 11kW motor incorporates seal pressure relief ports that prevent the pumping pressure from applying to the shaft seal.

KTZ32.2 KTZ33.7 KTZ47.5 KTZ611

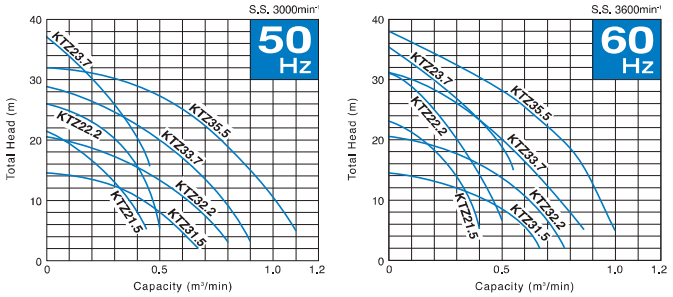
Discharge Bore mm	Model	Motor Output kW	Phase	Starting Method	Solids Passage mm	Dry Weight*2 kg	Cable Length m
50	**KTZ21.5**	1.5	Three	D.O.L.	8.5	34	8
50	**KTZ22.2**	2.2		D.O.L.	8.5	35	8
50	**KTZ23.7**	3.7		D.O.L.	8.5	60	8
80	**KTZ31.5**	1.5		D.O.L.	8.5	33	8
80	**KTZ32.2**	2.2		D.O.L.	8.5	34	8
80	**KTZ33.7**	3.7		D.O.L.	8.5	60	8
80	**KTZ35.5**	5.5		D.O.L.*1	8.5	74	8
100	**KTZ43.7**	3.7		D.O.L.	8.5	60	8
100	**KTZ45.5**	5.5		D.O.L.*1	8.5	74	8
100	**KTZ47.5**	7.5		D.O.L.*1	12	101	8
100	**KTZ411**	11		D.O.L.*1	12	133	8
150	**KTZ67.5**	7.5		D.O.L.*1	20	100	8
150	**KTZ611**	11		D.O.L.*1	20	133	8

*1 Star-Delta available upon request

*2 Weights excluding cable

Performance Curves

< 50·80mm >



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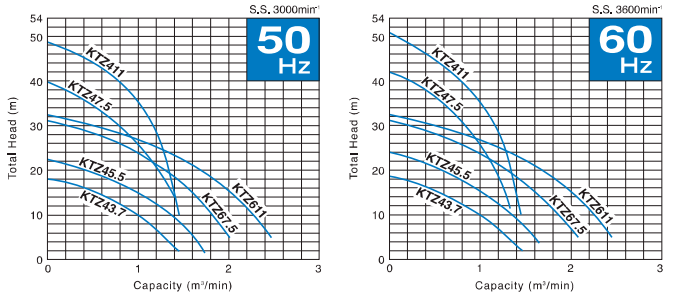
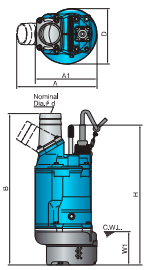


Dimensions

Unit: mm

Model	d	A	A1	B	D	H	W1
KTZ21.5	50	270	235	543	216	548	120
KTZ22.2	50	270	235	563	216	568	120
KTZ23.7	50	342	283	675	252	637	150
KTZ31.5	80	276	235	543	216	548	120
KTZ32.2	80	276	235	563	216	568	120
KTZ33.7	80	347	283	675	252	637	150
KTZ35.5	80	358	306	719	258	688	150
KTZ43.7	100	367	283	690	252	637	150
KTZ45.5	100	377	306	734	258	688	150
KTZ47.5	100	399	330	812	314	697	190
KTZ411	100	428	374	864	350	740	190
KTZ67.5	150	445	361	874	314	697	190
KTZ611	150	457	374	884	350	740	190



KTZE –Automatic Operation with Electrode–

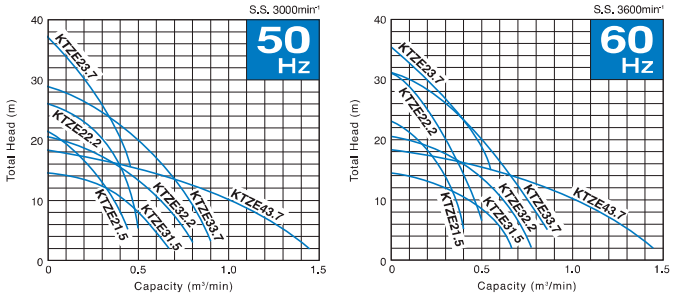
The KTZE-series is a submersible three-phase automatic cast iron high head heavy-duty drainage pump. An innovative electrode type relay unit built into the pump automatically starts and stops the pump to eliminate dry-running. This mechanism greatly reduces power consumption and extends operating life. The cast iron body with high-chromium cast iron impeller enables it to withstand demanding conditions found in construction, aggregate and mining applications. The top discharge, side flow design assures efficient motor cooling even when it operates with its motor exposed to air. The slim design allows the pump to be placed in a confined space. The discharge direction is selectable between vertical and inclined, which prevents folding or bending of the discharge hose.

KTZE32.2 KTZE33.7

Discharge Bore mm	Model	Motor Output kW	Phase	Starting Method	Solids Passage mm	Dry Weight* kg	Cable Length m
50	**KTZE21.5**	1.5	Three	D.O.L.	8.5	39	8
50	**KTZE22.2**	2.2		D.O.L.	8.5	41	8
50	**KTZE23.7**	3.7		D.O.L.	8.5	69	8
80	**KTZE31.5**	1.5		D.O.L.	8.5	38	8
80	**KTZE32.2**	2.2		D.O.L.	8.5	40	8
80	**KTZE33.7**	3.7		D.O.L.	8.5	69	8
100	**KTZE43.7**	3.7		D.O.L.	8.5	69	8

* Weights excluding cable

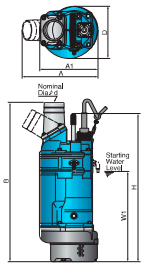
Performance Curves



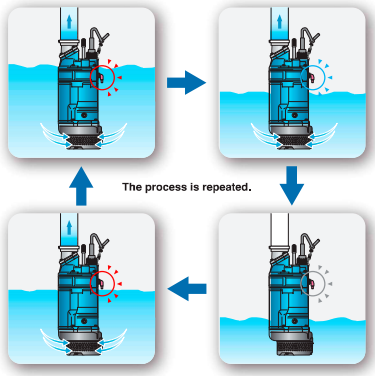
Dimensions

Unit: mm

Model	d	A	A1	B	D	H	W1
KTZE21.5	50	270	235	623	216	628	345
KTZE22.2	50	270	235	643	216	648	355
KTZE23.7	50	342	283	755	252	717	435
KTZE31.5	80	276	235	623	216	628	345
KTZE32.2	80	276	235	643	216	648	355
KTZE33.7	80	347	283	755	252	717	435
KTZE43.7	100	367	283	770	252	717	435



Automatic Operation



I Pump continues to run while the electric probe remains submerged.

II When the water surface falls below the electric probe, timer starts to count about one minute.

III Pump stops in about one minute after the water level falls.

IV When the water level rises to contact the electric probe, pump starts operating again.

The process is repeated.

KTD –Slurry Pumps with Agitator–

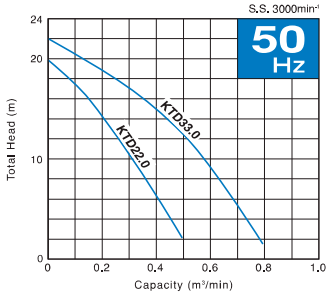
The KTD-series is a submersible three-phase cast iron heavy-duty slurry pump. It is equipped with an agitator that assists smooth suction of the settled matters. The pump parts such as the impeller and the suction cover are made of wear-resistant materials. The top discharge, side flow design assures efficient motor cooling even when it operates with its motor exposed to air. The slim design allows the pump to be placed in a confined space.

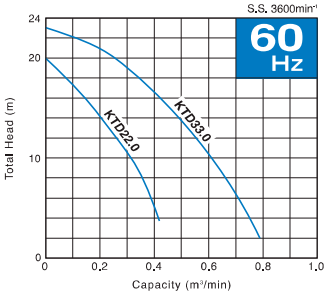
KTD22.0 KTD33.0

Discharge Bore mm	Model	Motor Output kW	Phase	Starting Method	Solids Passage mm	Dry Weight* kg	Cable Length m
50	**KTD22.0**	2	Three	D.O.L.	10	38	8
80	**KTD33.0**	3		D.O.L.	10	65	8

* Weights excluding cable

Performance Curves

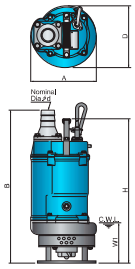




Dimensions

Unit: mm

Model	d	A	B	D	H	W1
KTD22.0	50	235	550	221	519	140
KTD33.0	80	297	644	266	654	160



Agitator

Tsurumi's slurry pumps have an agitator made of abrasion resistant material. It is mounted on the shaft and rotates to create a downward current. This agitator assists the pump in sucking and transferring bentonite slurry, slime, mud, and water with high sand content.

Specifications

		KTZ											KTZ		KTZE -Automatic-							KTD -Slurry-	
		KTZ21.5	KTZ22.2	KTZ23.7	KTZ31.5	KTZ32.2	KTZ33.7	KTZ35.5	KTZ43.7	KTZ45.5	KTZ47.5	KTZ411	KTZ67.5	KTZ611	KTZE21.5	KTZE22.2	KTZE23.7	KTZE31.5	KTZE32.2	KTZE33.7	KTZE43.7	KTD22.0	KTD33.0
PUMP	Discharge Bore mm	50			80				100				150		50			80			100	50	80
	Discharge Connection	Hose Coupling											Hose Coupling										
	Solids Passage mm	8.5									12		20		8.5							10	
	Impeller	Semi-open											Semi-open										
		High-chromium Cast Iron											High-chromium Cast Iron										
	Suction Cover	Ductile Cast Iron											Ductile Cast Iron										
	Oil Seal	Nitrile Butadiene Rubber									—		—		Nitrile Butadiene Rubber								
	Labyrinth Ring	—									304 Stainless Steel		304 Stainless Steel		—								
	Casing	Gray Cast Iron											Gray Cast Iron										
	Shaft Seal	Dual Inside Mechanical Seals (with Oil Lifter)											Dual Inside Mechanical Seals (with Oil Lifter)										
		Silicon Carbide											Silicon Carbide										
	Agitator	—											—									Ductile Cast Iron	
MOTOR	Type	Continuous-duty Rated, Dry-type Induction Motor											Continuous-duty Rated, Dry-type Induction Motor										
	Output kW	1.5	2.2	3.7	1.5	2.2	3.7	5.5	3.7	5.5	7.5	11	7.5	11	1.5	2.2	3.7	1.5	2.2	3.7		2	3
	Phase	Three											Three										
	Pole	2											2										
	Insulation	F											F										
	Starting Method	D.O.L.											D.O.L.										
	Motor Protector (built-in)	CTP											CTP										
	Lubricant ml	740		1250	740		1250	1100	1250	1100	760		760		740		1250	740		1250		740	1250
		Turbine Oil (ISO VG32)											Turbine Oil (ISO VG32)										
	Frame	Gray Cast Iron											Gray Cast Iron										
	Shaft	420 Stainless Steel											420 Stainless Steel										
	Cable m	8											8										
		PVC		Chloroprene Rubber	PVC		Chloroprene Rubber						Chloroprene Rubber		PVC		Chloroprene Rubber	PVC		Chloroprene Rubber		PVC	Chloroprene Rubber
Automatic Control Device		—											—		Electrode							—	
Dry Weight* kg		34	35	60	33	34	60	74	60	74	101	133	100	133	39	41	69	38	40	69		38	65

* Weights excluding cable

TSURUMI PUMP

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We reserve the right to change the specifications and designs for improvement without prior notice.

TSURUMI
MANUFACTURING CO., LTD.

Your Dealer

Printed in Japan IB107-B HB-C-K-U

Booster Pumps

DILLON CONSULTING

P-01 A/B - Booster Pumps

SWX200

Bronze Marine Pump

2” x 2” End Suction Centrifugal Pump

Manufactured in investment cast Nickel Aluminum Bronze CA954, the SWX series of pumps were designed for applications pumping seawater.

The pumps are equipped with enclosed impellers standard to ensure optimum efficiency and low HP ratings. The integral impeller sleeve eliminates exposure of the motor shaft. Type 52 Silicon Carbide/Silicon Carbide/Viton mechanical seal offers excellent resistance to harsh seawater applications. The volute is sealed with a viton o-ring.

All pumps are close coupled to 60/50 HZ TEFC motors with IP (Ingress Protection) rating of IP44 (single phase) to 55 (three phase) compliant with ISO8846 marine ignition duty.

The pump also meets CE and EU requirements.

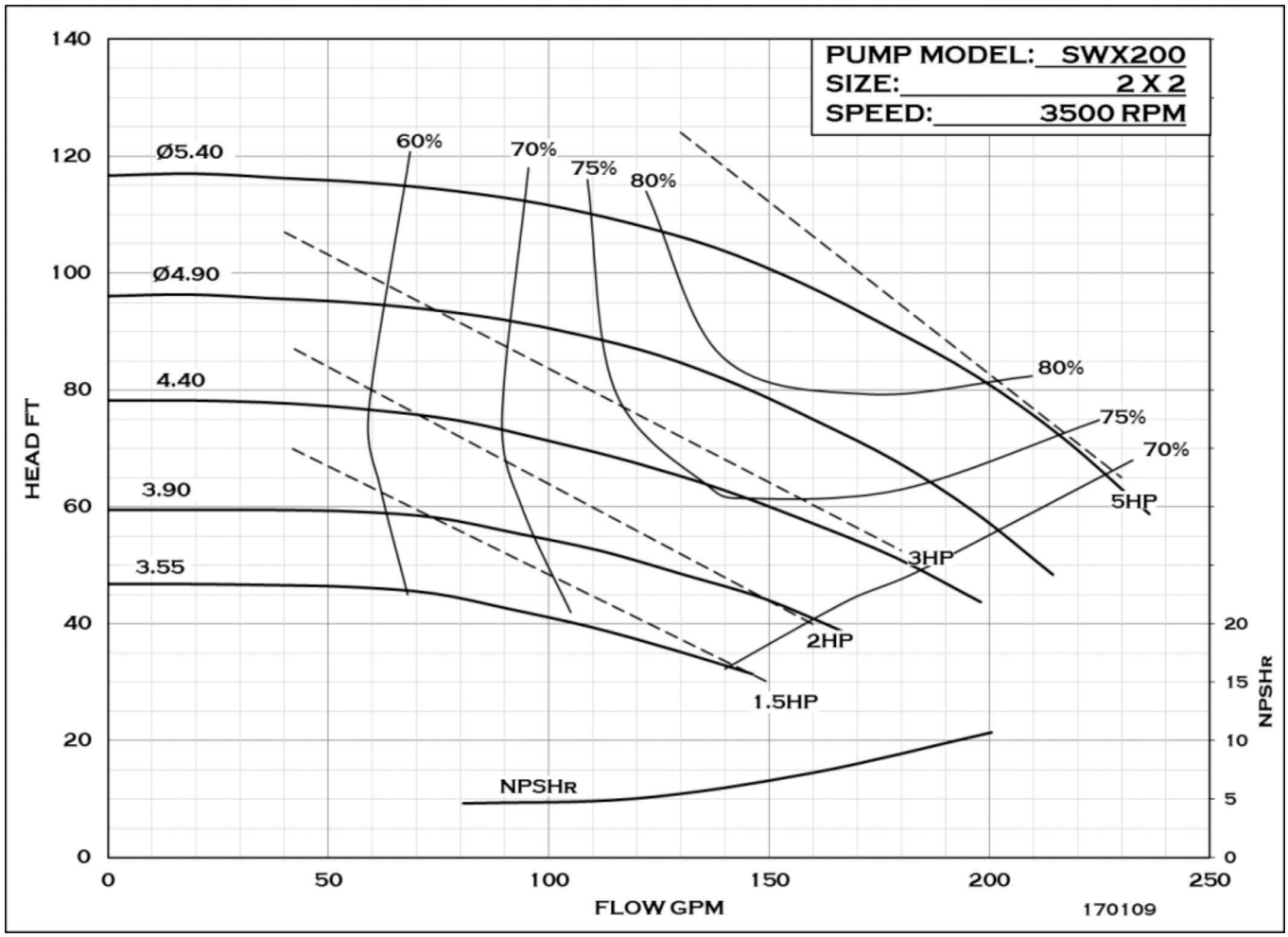
Application

- Marine

SPECIFICATIONS:

Suction And Discharge	2.0" x 2.0" NPT
Materials Of Construction	316 SS, Bronze
Impeller	Balanced to meet ISO1940-1 G6.3 for optimum efficiency
O Ring	Viton
Seal	T-52 Sil. Carbide/Sil. Carbide/Viton/316SS
Motor	145/184JM TEFC, CE, 60/50 HZ, IP44 to meet ISO8846 marine ignition duty
And CE Reqs.	Array
Or Shaft	Array

SWX200



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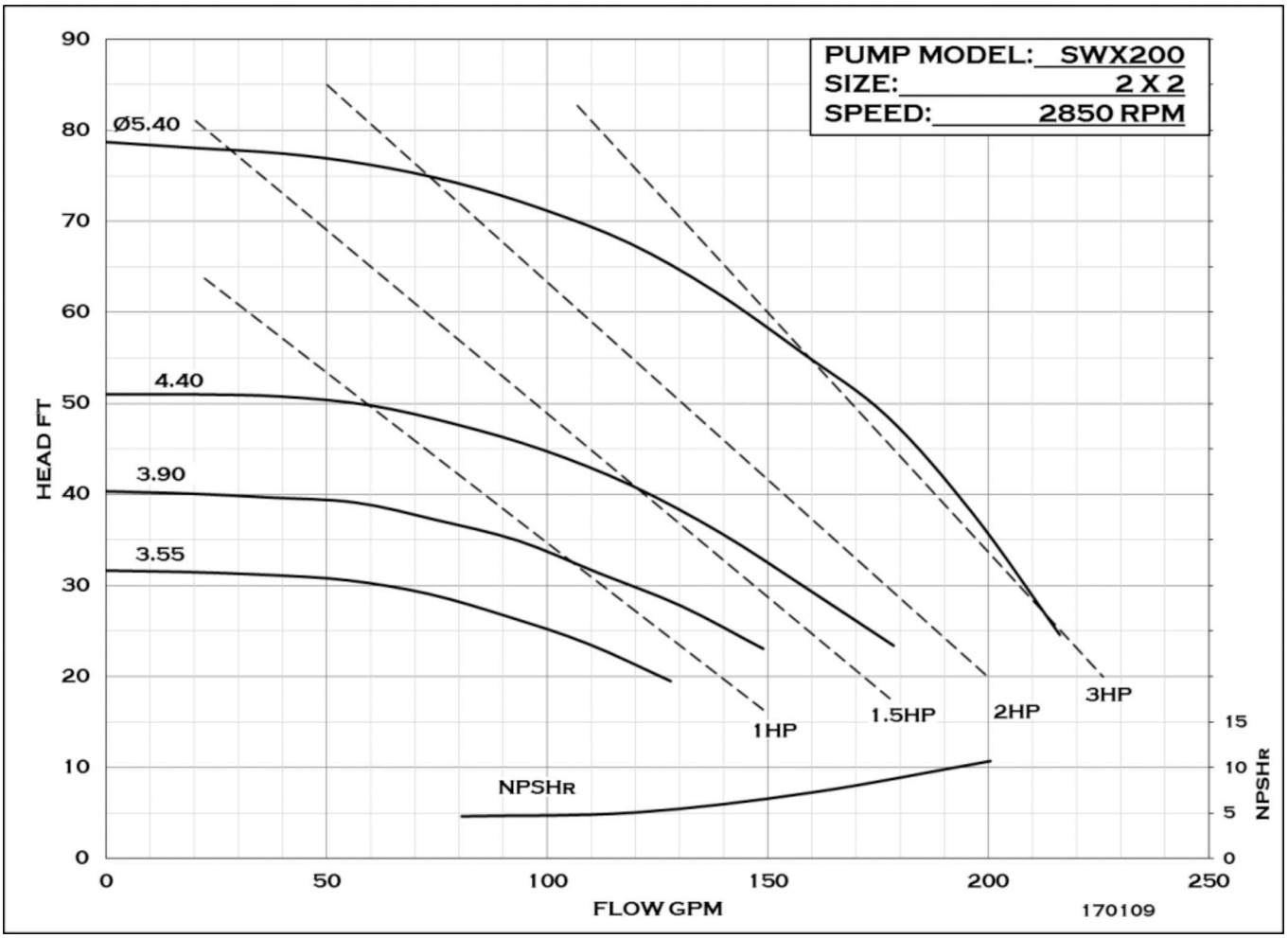
(800) 563-8006 - www.mppumps.com

SWX200



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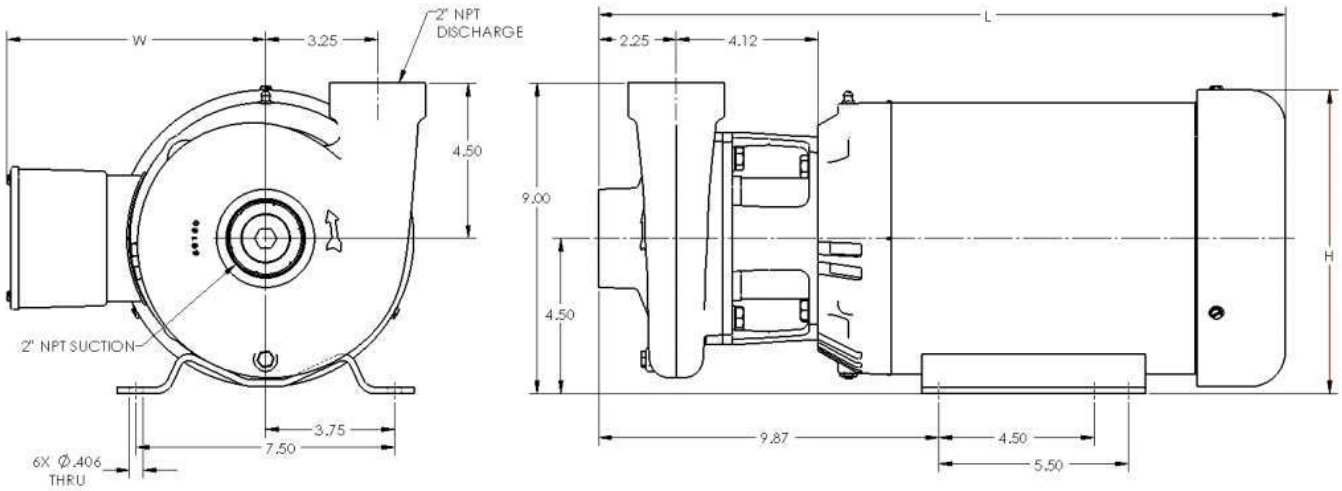
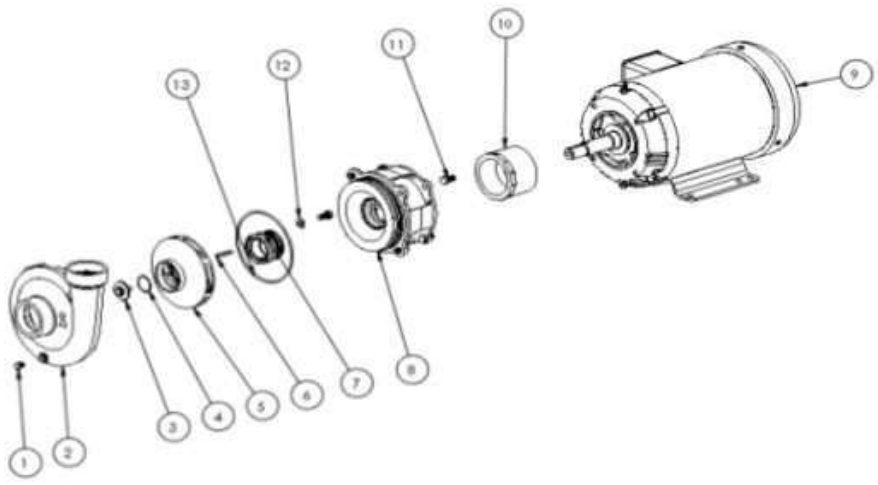
SWX200


W
3.25
2" NPT
DISCHARGE
4.50
2" NPT SUCTION
3.75
7.50
6X Ø.406
THRU
L
2.25
4.12
9.00
4.50
H
9.87
4.50
5.50

ITEM NO.	PART NO.	DESCRIPTION	QTY
1	36355	PIPE PLUG, BRONZE 1/8" NPT	1
2	50151	HOUSING	1
3	50153	SEAL BOLT	1
4	50158	O-RING, VITON AS-568-024	1
5	50155	IMPELLER 5.4	1
	50489	IMPELLER 4.9	1
	50225	IMPELLER 4.4	1
	50226	IMPELLER 3.9	1
	50227	IMPELLER 3.65	1
6	26588	SQUARE KEY	1
7	26461	SEAL ASSEMBLY, SIL. CARBIDE/SIL.CARBIDE	1
8	50157	ADAPTER	1
9	50447	MOTOR, 7.5 HP-3 PH 184JM TEFC	1
	50160	MOTOR, 5 HP-3 PH 184JM TEFC	1
	50222	MOTOR, 3 HP-3 PH 184JM TEFC	1
	50223	MOTOR, 2 HP-3 PH 145JM TEFC	1
	50224	MOTOR, 1.5 HP-3 PH 145JM TEFC	1
10	50214	SHAFT GUARD, PVC	1
11	25663	CAPSCREW 3/8-16 x 3/4 304 SS	8
12	21266	LOCKWASHER 3/8 x 1/8 304 SS	4
13	50159	O-RING, VITON AS-568-252	1



Auto Backwash Strainers

DILLON CONSULTING

F-01 & F-02 Self-Cleaning Filters

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Self Cleaning Water Filters

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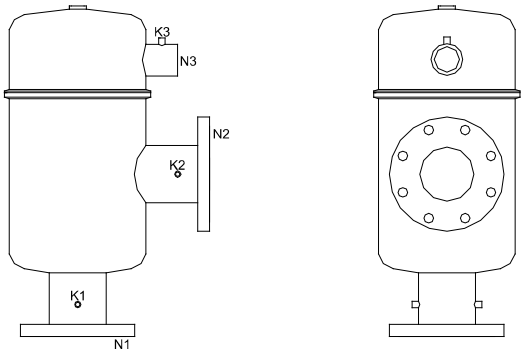
90 SERIES
SELF CLEANING WATER FILTER
OPERATION & MAINTENANCE MANUAL

CONTENTS

Filter Basics

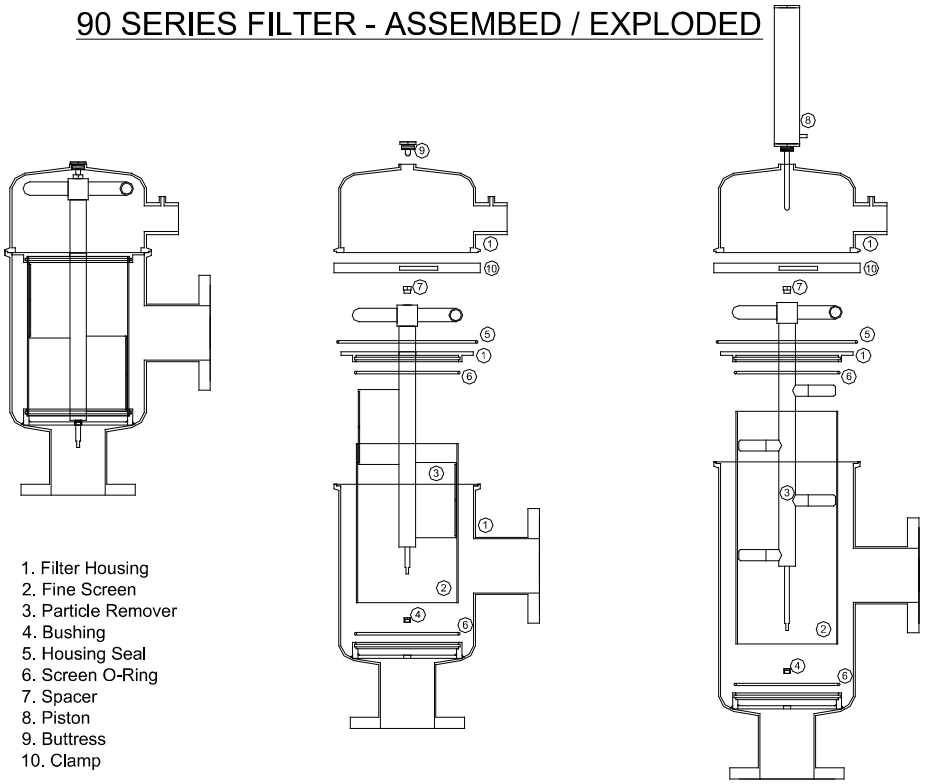
Forsta 90 Series are self cleaning screen water filters. The major components include the Filter Housing (1), Fine Screen filter element (2), Particle Remover (3), Hydraulic Piston (8), and Backwash Valve (12).

90 SERIES FILTER - GENERAL LAYOUT



NOZZLE	DESCRIPTION
N1	INLET
N2	OUTLET
N3	FLUSH OUTLET
K1	HYD CONNECTION
K2	HYD CONNECTION
K3	HYD CONNECTION

90 SERIES FILTER - ASSEMBED / EXPLODED

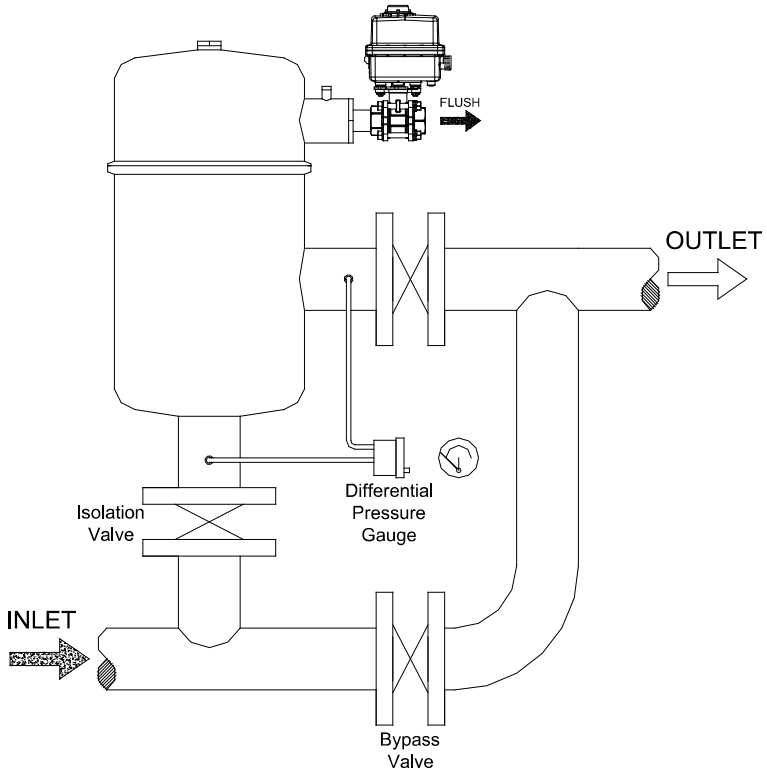


1. Filter Housing
2. Fine Screen
3. Particle Remover
4. Bushing
5. Housing Seal
6. Screen O-Ring
7. Spacer
8. Piston
9. Buttress
10. Clamp

Installation Requirements

90 Series filters may be mounted directly on the inlet (N1) and outlet (N2) flanges, and positioned in any orientation. Isolation valves should be installed at the inlet and outlet, and a bypass valve should be installed between the flanges. This will allow the filter to be taken offline periodically without disruption to water flow.

90 SERIES FILTER - INSTALLATION LAYOUT



There should be adequate clearance around the filter to allow for easy maintenance access. The minimum clearance above the top portion depends on the model. There must be enough room to remove the fine screen periodically.

FLUSH LINE

The piping for the flush valve must have no backpressure. It is strongly recommended to use oversized piping to accommodate this requirement. For example, if the 90 Series filter uses a 1" valve, the recommended pipe is a minimum of 2".

To minimize backpressure on the flush line, it is also important to avoid elevation gain. Even a small elevation gain can reduce the filter's ability to perform an effective backwash cycle. If flush water must be transported to higher elevation, it is recommended to pipe the flush line to a storage tank first, and then pump out to higher elevation.

HYDRAULIC CONNECTIONS

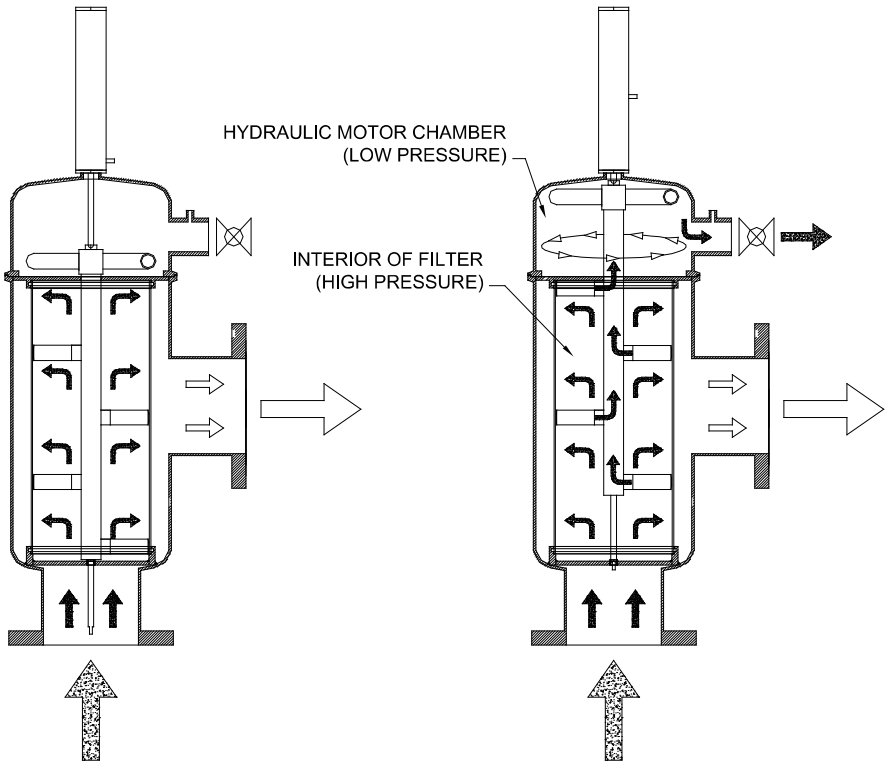
Each flanged connection nozzle (N1) on the 90 Series filter has two ¼" threaded couplings. One may be used to install a pressure gauge or other sensor equipment. The other ¼" coupling will be used to connect hydraulic tubing from the differential pressure switch to the filter. The high pressure line is fitted to the inlet, and low pressure fitted to the outlet.

HYDRAULIC PISTON (if applicable)

The piston (8) is mounted on the top section of the filter. ¼" tubing must be installed from the fitting located on the back of the piston to the hydraulic connection (K3) on the flush outlet (N3). A filter is installed on the hydraulic tubing to protect the piston.

Filter Performance

90 SERIES FILTER - OPERATION



NORMAL OPERATION

Debris is trapped as water passes through the inlet and across the fine screen. Clean water exits through the outlet of the filter.

BACKWASH CYCLE

The flush valve opens and lowers the pressure in the top section. This causes the particle remover to vacuum the inside of the screen, expelling debris through the flush outlet.

NORMAL OPERATION

During normal operation of the filter, dirty water enters through the inlet, travels down the center of the filter and is strained across the fine screen. As water passes from inside the screen to outside, suspended particles are trapped on the fine screen and continue to buildup, eventually creating a drop in pressure at the outlet of the filter.

This drop in outlet pressure is monitored by the differential pressure gauge, which at seven PSID (pounds per square inch differential) sends a signal to the controller to initiate a backwash cycle.

BACKWASH CYCLE

The controller opens the flush valve, which causes a drop in pressure in the hydraulic motor chamber. This creates a low pressure path inside the particle remover, which acts as a vacuum at the end of the suction nozzles, removing the built up debris from the inside of the fine screen.

Water flows through the suction nozzles, down the interior of the particle remover, and out the hydraulic motor. The motor rotates the particle remover, enabling each suction nozzle to cover a radial strip of screen.

If a piston is installed, the pressure difference between the interior of the filter and the hydraulic motor chamber drives the particle remover toward the hydraulic piston. The piston depressurizes during the backwash cycle, and expels the volume of water from its chamber. This acts as a timer, gradually allowing the particle remover to drive the piston rod into the piston, assuring that the suction nozzles cover the entire surface of the fine screen. When the piston reaches the end of its stroke, the backwash cycle is complete, and the flush valve closes. Pressure inside the hydraulic motor chamber normalizes, and the piston pushes the particle remover back to its original position.

After the piston and particle remover move back to their original positions, the filter returns to normal operation. During the entire backwash cycle, the main flow through the filter is never disrupted.

Flow & Pressure Requirements

Forsta 90 Series filters have a minimum pressure requirement of 40 PSI. This includes any pressure loss incurred during the backwash cycle. Therefore the pump performance is a crucial component in determining whether the filter will perform correctly.

Pump manufacturers will provide the performance data in the form of a pump curve. This is a graph that plots pressure vs. flow rate. A pump is considered adequate for an application if it can maintain a minimum of 40 PSI while pumping the normal system flow AND the additional flow required during backwash. The additional flow depends on the filter model and what valve is used.

90 SERIES FILTER - VALVE FLOW RATES

Valve	Flow Rate
1"	40 gpm
1.5"	100 gpm
2"	220 gpm

Maintenance & Spare Parts

STARTUP

When pumping water through the Forsta 90 Series for the first time or after it has been emptied, it is important to follow a correct sequence of valve actuation in order to prevent damage to the filter components.

With both isolation valves closed and the bypass valve open, the correct sequence is:

1. Slowly open the inlet isolation valve letting water flow into the filter. Let the entire filter fill with water before moving to the next step.
2. Close the bypass valve.
3. Open the outlet isolation valve.

If it is not possible to close the bypass valve momentarily before opening the outlet valve, then both may be actuated simultaneously.

SHUTDOWN

To remove the filter from operation, reverse the steps used for startup.

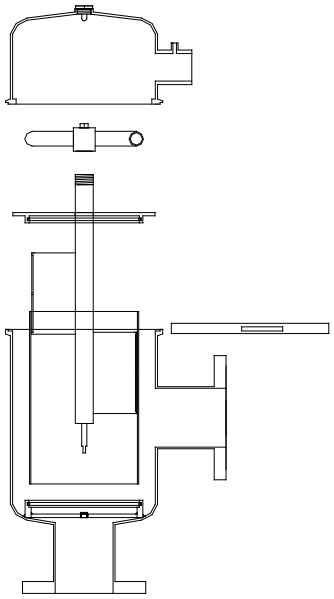
1. Close the outlet valve.
2. Open the bypass valve
3. Close the inlet valve. There will be residual pressure in the tank still, so use caution when draining.

If it is not possible to close the outlet valve momentarily before opening the bypass, then both may be actuated simultaneously.

PERIODIC MAINTENANCE

Every six months to a year, or during scheduled down-time it is recommended to open the filter and inspect the components. Access to the internal components can be gained by removing the clamp and top section. Lift the particle remover and plate straight out of the filter housing and separate the two. Inspect both for wear.

90 SERIES FILTER - INSPECTION

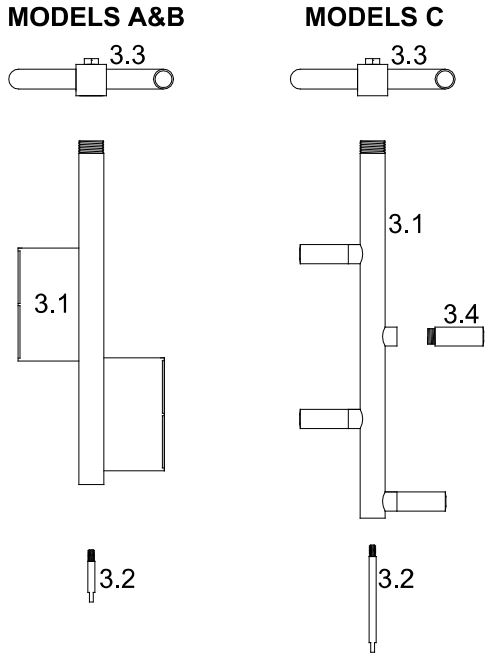


Remove the screen and o-rings. The screen mesh and bushing should be inspected for wear, as well as the particle remover rod and suction nozzles.

SPARE PARTS
Spare parts for maintenance for two years include:

Screen O-rings (6)
Cover Seal (5)
Suction Nozzles (3.5)
Bushing (4)
Differential Pressure Gauge (18)
Piston Seal Kit (8K)
Mini-Filter (16)
Valve (12)
Fine Screen (2)
Particle Remover (3)
Spacer (7)

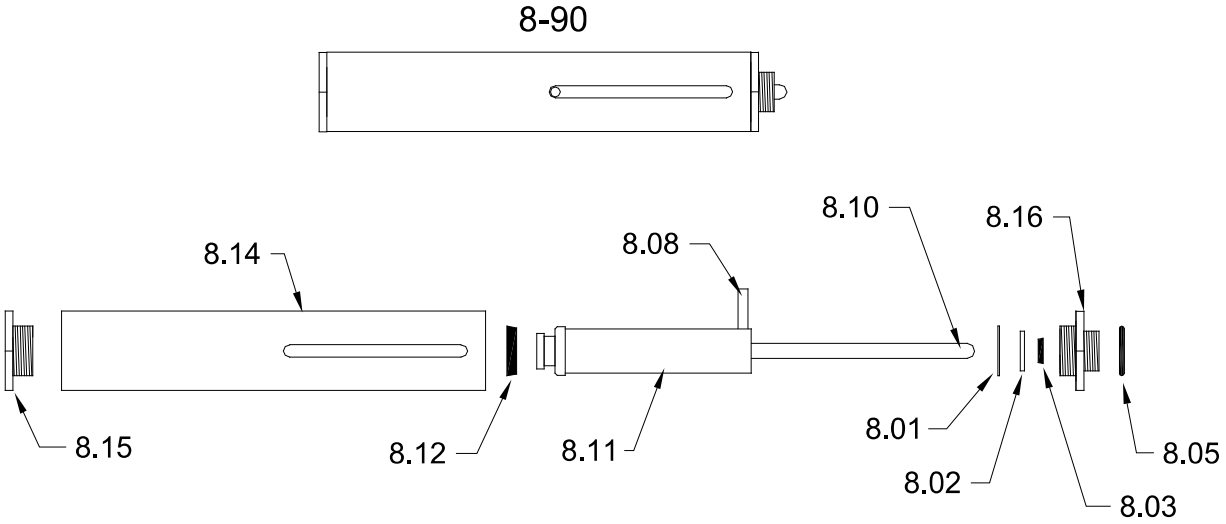
90 SERIES PARTICLE REMOVER - AB & C MODELS



PARTICLE REMOVER - PART LIST

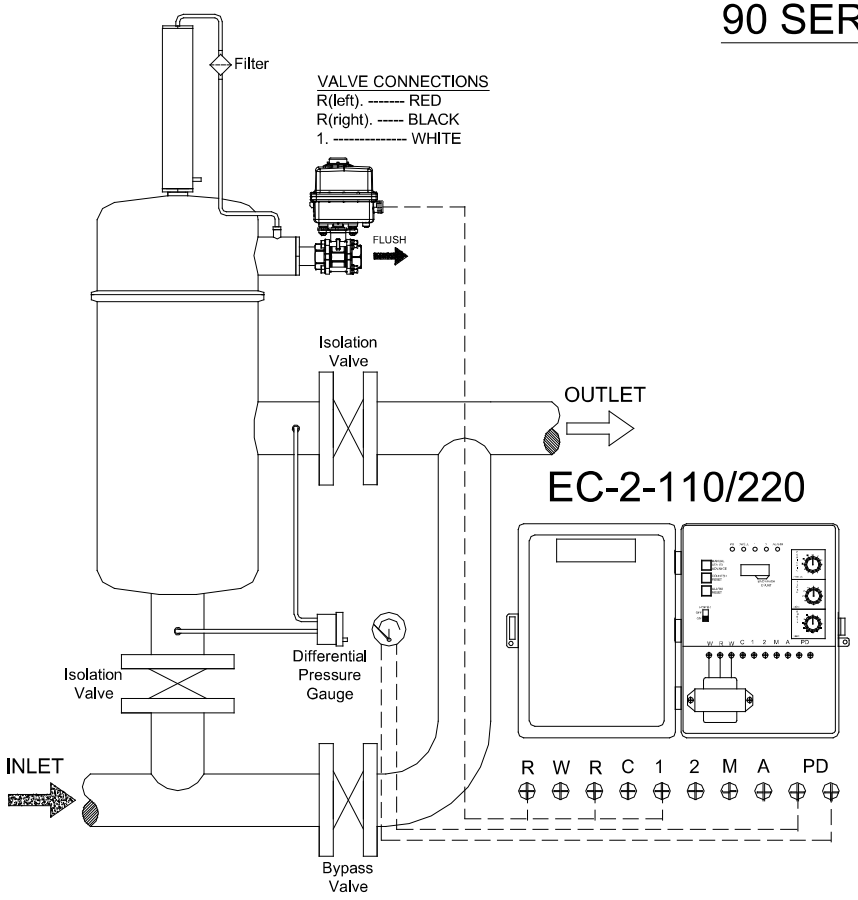
ITEM	PART NUMBER
Particle Remover	3
Housing	3.1
Rod	3.2
Hydraulic Motor	3.3
Suction Nozzle	3.4

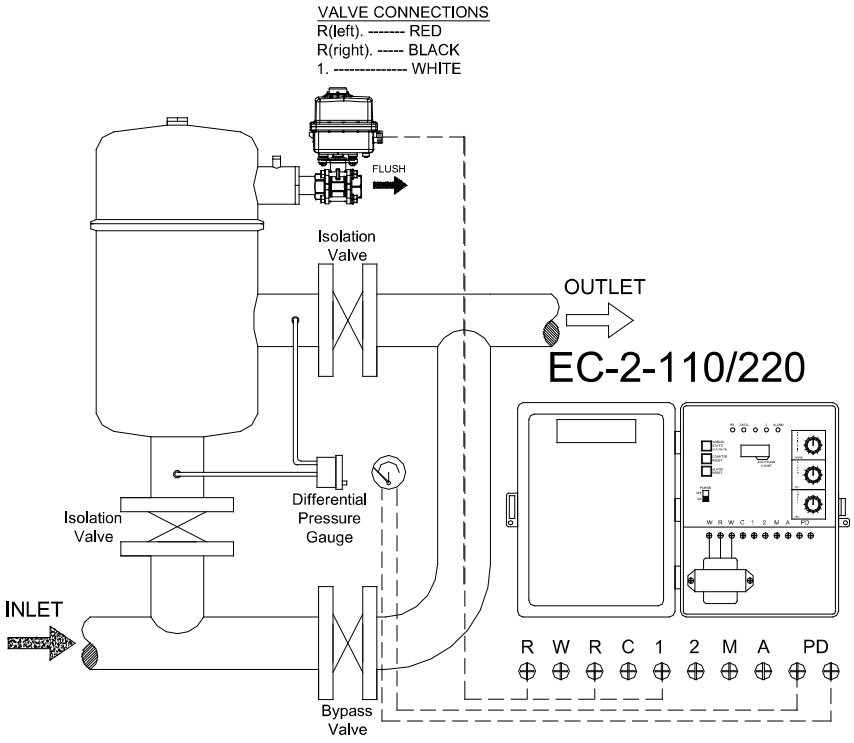
90 SERIES PISTON



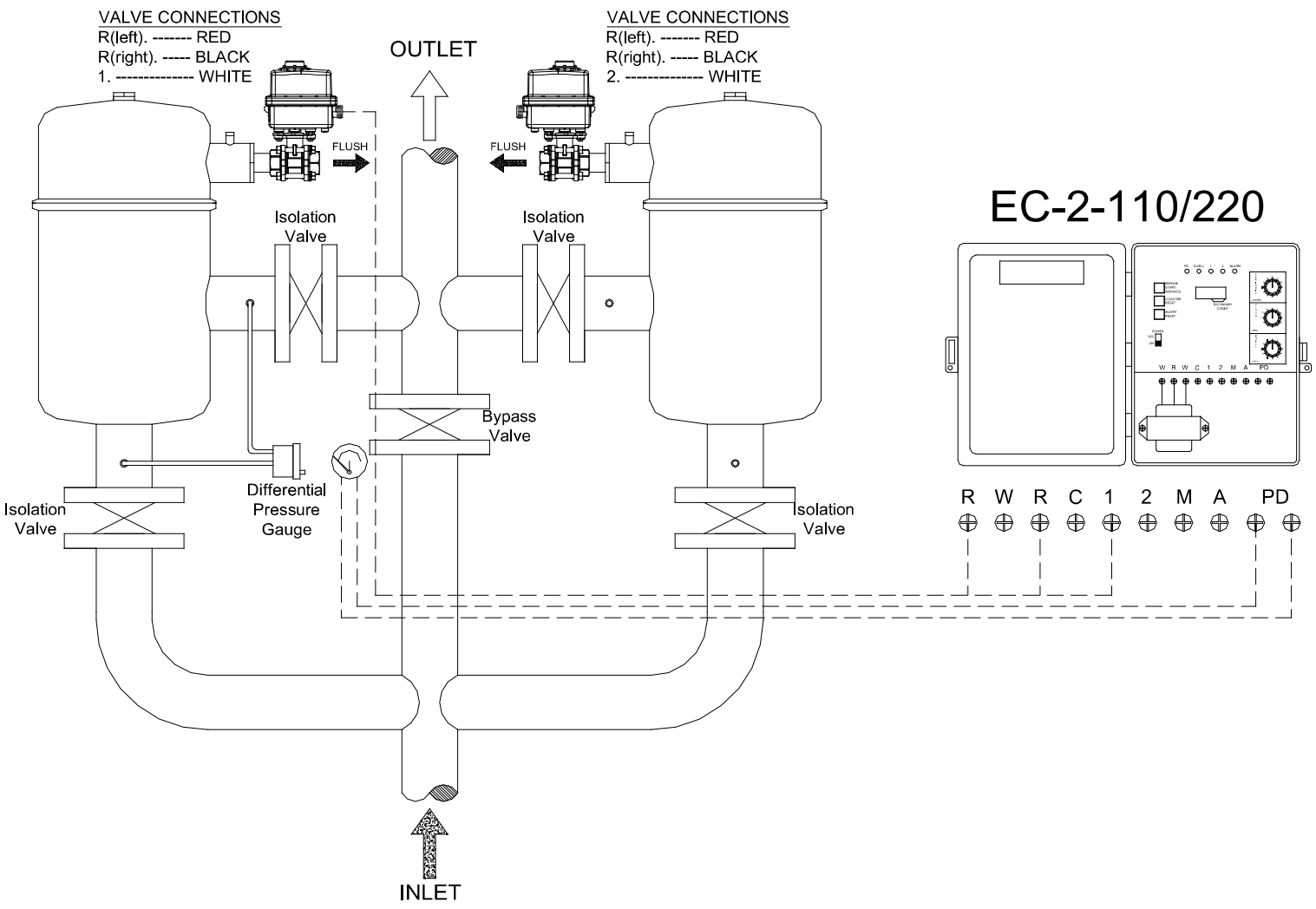
ITEM	PART NUMBER
Hydraulic Piston	8-90
Snap Ring	8.01-90
Head Ring	8.02-90
Shaft U-cup	8.03-90
Head O-ring	8.05-90
Piston Pin	8.08-90
Shaft	8.10-90
U-cup Holder	8.11-90
Casing U-cup	8.12-90
Casing	8.14-90
Casing Cap	8.15-90
Piston Head	8.16-90

90 SERIES FILTER - EC-2 WIRING



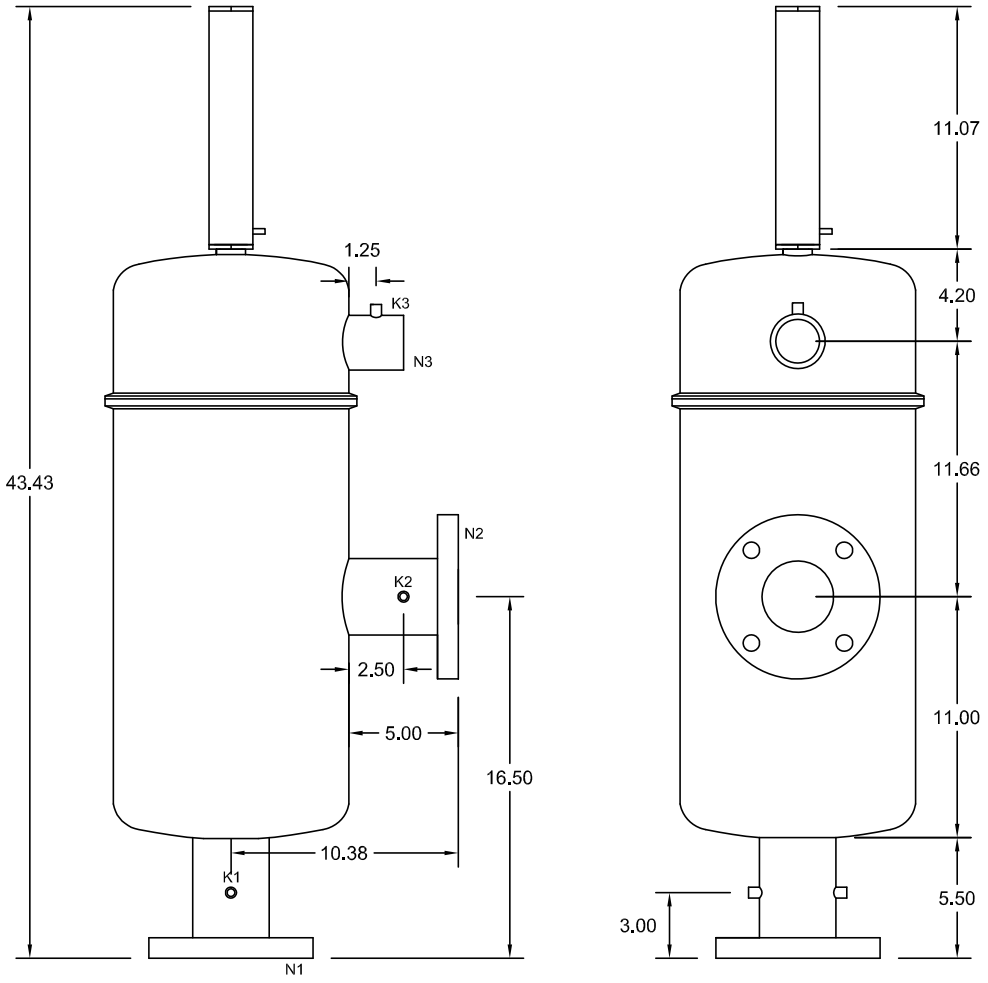


2 x 90 SERIES FILTERS - EC-2 WIRING



Warranty

Forsta Filters guarantees all self cleaning water filters, components, and accessories free of defects for one year from the date of installation, or 18 months from the date of original shipment. Forsta will replace any part found defective during the warranty period, provided the equipment in question was handled, installed, and operated in accordance with the operation and maintenance manual and sound engineering practices. Forsta Filters assumes no liability for incidental or consequential damage resulting from the use of its products, services, or data. Liability is limited to replacement or repair of products provide by Forsta Filters, and no agent or sales representative has authority to extend the warranty period without the express written consent of Forsta Filters, Inc. Shipping charges for returned equipment will be at the expense of the purchaser, and all returned equipment must be sent to Forsta Filters.



NOZZLE	DESCRIPTION	SIZE	QTY
N1	INLET	3" 150#	1
N2	OUTLET	3" 150#	1
N3	FLUSH OUTLET	2" FNPT	1
K1	HYD CONNECTION	¼" FNPT	2
K2	HYD CONNECTION	¼" FNPT	1
K3	HYD CONNECTION	¼" FNPT	1

FILTER PERFORMANCE	
MAX FLOW RATE (gpm)	300
SCREEN AREA ($ft.^2$)	3
MAX TEMP. (°F)	200
MAX PRES. (psi)	150
VESSEL WEIGHT (lbs)	50

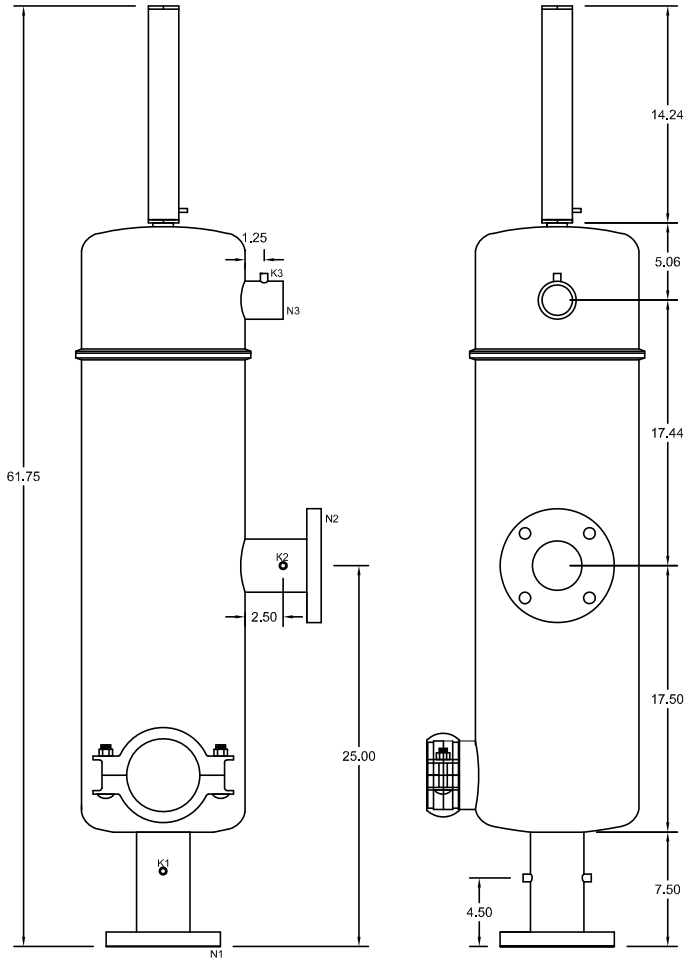
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGULAR
.XX ± .05 ± 0.5 DEG.
.XXX ± .01

FORSTA FILTERS
Self Cleaning Water Filters

C3-90

SIZE	FSCM NO.	DWG NO.	REV
		C3-90	3

SCALE		SHEET
3.50		1 of 1



NOZZLE	DESCRIPTION	SIZE	QTY
N1	INLET	3" 150#	1
N2	OUTLET	3" 150#	1
N3	FLUSH OUTLET	2" FNPT	1
N4	SERVICE PORT	4" VIC	1
K1	HYD CONNECTION	¼" FNPT	2
K2	HYD CONNECTION	¼" FNPT	1
K3	HYD CONNECTION	¼" FNPT	1

FILTER PERFORMANCE	
MAX FLOW RATE (gpm)	300
SCREEN AREA (ft.^{2})	5
MAX TEMP. (°F)	200
MAX PRES. (psi)	150
VESSEL WEIGHT (lbs)	160

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES
DECIMALS ANGULAR
.XX ± .05 ± 0.5 DEG.
.XXX ± .01

FORSTA FILTERS
Self Cleaning Water Filters

CXL3-90

SIZE	FSCM NO.	DWG NO.	REV
		CXL3-90	2

SCALE		SHEET
3.50		1 of 1

Cartridge Filters

DILLON CONSULTING

CF-01 and CF-02 - Cartridge Filter

TECHNICAL PROPOSAL

FRP HIGH FLOW CARTRIDGE FILTER HOUSING

Canadian Water Technologies

Mr. Michael Pacholski

Project Name: Containerized SWRO

Project Reference:

Proposal No.: Q-180724-01R02

Date: July 24th, 2018

Submitted by

Ties Venema

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Piedmont

Table of content

Piedmont

1. EXECUTIVE SUMMARY

Subject: Quotation submission for a containerized SWRO solution

Dear Mr. Michael Pacholski,

In the first place, we would like to express our sincere gratitude for your confidence and trust by providing us with the opportunity to quote against your requirements for the aforementioned optimization opportunity.

We strongly believe that our extensive experience in the engineering, manufacturing and commercialization of FRP filter housings for the desalination market places us in a position to offer a competitive product, the manufacturing capabilities and project management for the required scope with all the guarantees needed to bring this project to a successful end.

We will reply to your confidence by offering an attractive solution which is perfectly in compliance with your needs.

Some of the main advantages of the filter housings proposed in this document are:

1. Housing is made out of FRP material: corrosion and maintenance free. Best practice on RO plants in corrosive environments.
2. All internal components are 100% free of any metallic components and made of highly resistant polymers: Maintenance free.
3. Much quicker cartridge filter change, for the following two reasons:
    a. Quick opening system, as opposed to traditional opening system with flange and numerous bolts.
    b. Only 1 high flow element with easy handle for fast installation and removal, as opposed to multiple traditional cartridge filter elements with time consuming installation and removal procedure.
4. Compact and light design, with only 200 mm (8”) diameter. This facilitates the incorporation in a containerized solution with very stringent space and weight constraints.

We hope you will enjoy your review of this proposal as well as that you are attracted by the technical aspect of it.

Should you require any further clarifications or have any comments regarding the same, please do not hesitate in contacting me at any time.

With best regards,

Ties Venema
Commercial Director - Piedmont

Piedmont

2. COMPANY PROFILE

Piedmont Pacific specializes in providing engineered for corrosive and high pressure environments. Our expertise in the water industry has a long history which allowed us to develop unique products for the water treatment and desalination industry. Piedmont Pacific offers flexible stainless steel and engineered composite couplings in addition to fiberglass reinforced polyester cartridge filter housing and are designed to offer safe and reliable service.

A. MISSION & VISION

To provide the water treatment industry with engineered stainless steel and composite couplings in addition to fiberglass reinforced polyester cartridge filter housing for wet and corrosive environments in order to maintain the mechanical integrity and safety of water treatment systems throughout their service life.

B. DUPLEX & SUPER DUPLEX ADVANTAGE

Our Styles D & F couplings are cast in duplex or super duplex stainless steel type CE3MN alloy conforming to ASTM A995 Grade 2A. Both are austenitic-ferrite stainless steel and are highly resistant to chloride stress corrosion. With a minimum Pitting Resistance Equivalent Number (PREN) of 34 for duplex and 42 for super duplex, these fittings are the preferred material for sea water applications. Duplex and super duplex alloys also offer better mechanical properties when compared to conventional 316L stainless steel.

C. COMPOSITE RESIN ADVANTAGE

Our low pressure Style P couplings are made of glass filled composite resin, one of the strongest resin couplings on the market. The main advantages of these couplings are their lightweight construction and complete corrosion resistance. They are also UV resistant and non-water adsorptive, which makes them ideal for low pressure applications.

D. FIBERGLASS REINFORCED POLYESTER ADVANTAGE

Our cartridge filter housings are made of fiberglass reinforced polyester, one of the strongest non-metallic filter housings on the market. The main advantages of these filter housing are there complete corrosion resistance, their low maintenance content and easiness to operate.

E. QUALITY CONTROL

Piedmont employs strict manufacturing standards to ensure the quality, durability and strength of all our parts. With each batch, we record quality data on a certificate of material at the foundry, and continue to monitor quality through the packaging and labeling of the boxes to shipment of the parts. Our suppliers comply with these same high quality standards, and are audited regularly by our QC team.

Piedmont

3. TECHNICAL DATA

A. FIBERGLAS REINFORCED POLYESTER

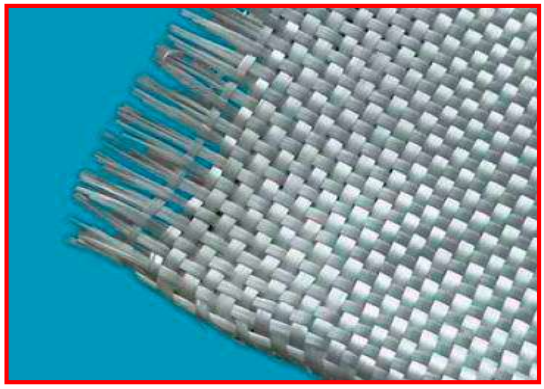
The Fundamentals of Fiberglass:

Composites are materials made up of individual components, whose combined physical strength exceeds the properties of either of them individually. In the case of composite laminates, there are two basic elements involved: **fibrous reinforcement** (Fiberglass in our case), and **resin**.

The **Fibrous reinforcements** are chosen very carefully in order to assure optimum design and performance of our Filter Housings:

Material in *tow and roving* form exhibits the highest properties achievable for a given fiber family and which is why it is used for our filament winding process, achieving by this extremely strong tubes, the pillar of our Filter Housings.

The *woven fabrics* are strong reinforcements because the fibers are bundled into yarns oriented in just two directions. The warp and fill yarns run at 0 and 90 degrees respectively. Thus, these fabrics are anisotropic, or strong in only two directions. The woven fabrics are oriented so the fiber yarns run parallel to the expected loads defined by our engineering and are used to build the structural parts of the Filter Housings.

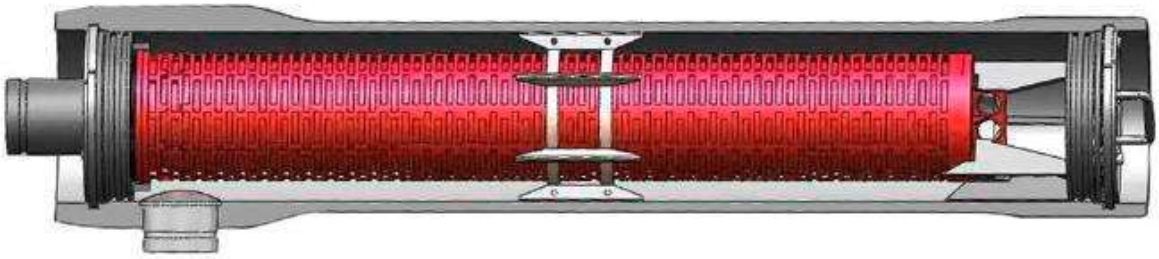


This *chopped strand mat* material is where the fibers are typically three to four inches in length and are randomly oriented. Chopped strand mat is isotropic which means that it is equally strong in all directions and is sued to build thickness into non-structural parts of our Filter Housing.
The **resin** selection is a key factor for the FRP manufacturing and is based on fabric compatibility, service conditions, and the desired characteristics of the finished part of our Filter Housings. Piedmont uses **Vinyl Ester** Resin (FDA approved Derakane 411) as a chemical barrier due to its resistance to a wide range of acids, alkalis, bleaches and solvents. It offers excellent corrosion and abrasion resistance, so it can be used in many chemical processing applications as well. This resin offers excellent toughness and fatigue resistance.

For the structural parts, **Isophtalic** polyester resin is used as it offers high strength, good flexibility and chemical resistance. Isophthalic resins exhibit good resistance to water, acids, weak bases, and furthermore hydrocarbons such as gasoline and oil.

B. ENGINEERING

Our FRP cartridge filter housings are designed according to the EN13121 design code (*GRP tanks and vessels for use above ground*). The calculations for the thicknesses of the head, shell, end caps, flanges, bolts, tube sheet plate, supporting structure and the like are done in strict compliance with the widely accepted engineering code and its safety factors. Although we standard design our filter housings according to the EN13121 code, we can customize and design according to different codes like the ASME X, AS1210, Ad Merkblatt code, BS 4994, etc.

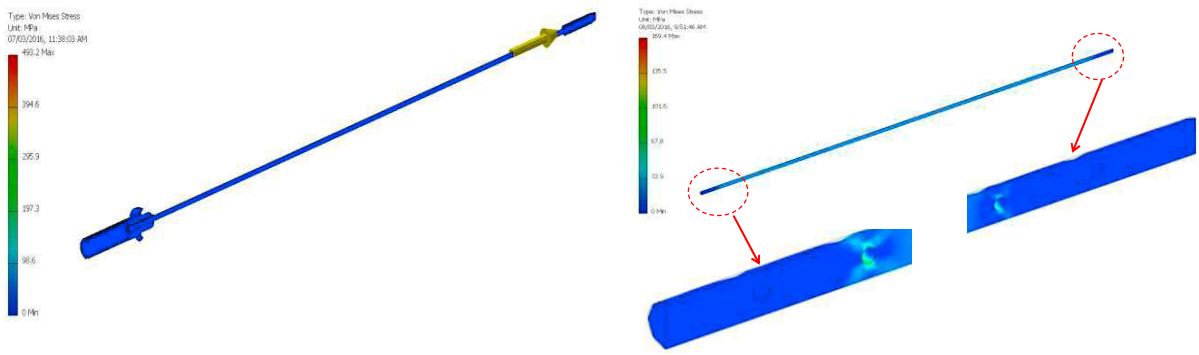


High Flow Design – Exploded View

Design calculations

Using input data like among others the diameter of the filter, the shell´s length, the design pressure, the design temperature, and taking into consideration the design coefficients, the short term and long term properties for both the filament winding and manual lay-up processes (for instance the hoop and axial tensile and flexural strength and modulus), we define the wall and reinforcements thicknesses.

Finite Element Analysis is used for simulating fatigues and stresses that our filter housings and internal components will have to endure when in operating conditions. An innovative design and manufacturing process in combination with the correct material selection has allowed us to improve the current state of the art of the internal cartridge support rods by enhancing performance and resistance to failure by more than 300%.

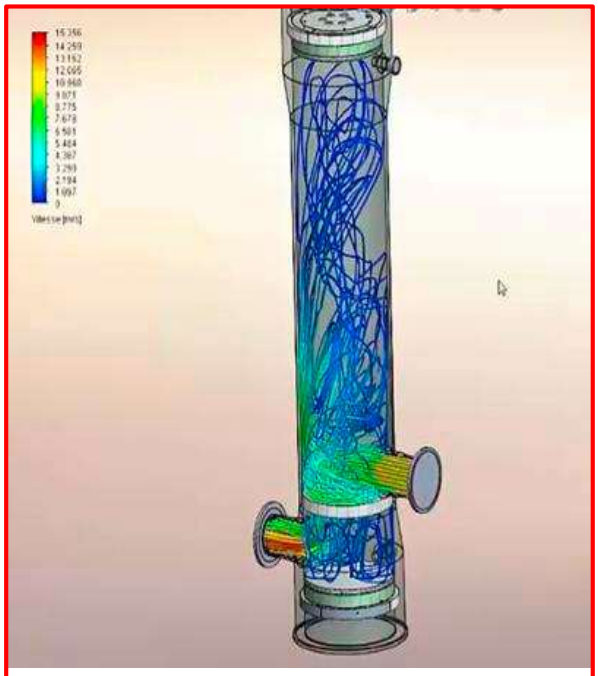


Support rod FEA examples

Piedmont

Through SOLIDWORKS **Flow Simulation** that uses Computational Fluid Dynamics (CFD) for numerical analysis and algorithm we are able to analyse and solve problems that involve fluid flows. We can easily calculate fluid forces and understand the impact of the liquid on the filter housing's performance and behavior that is critical to our design success.

By means of the CFD simulation we assure optimal flow distribution among the equidistant placed cartridge element within the filter housing so that filtration performance is enhanced and pressure drop minimized.



Flow Simulation (CFD)

Although we have our standard product line and filter housing designs, we are completely flexible in our designs and can customize according to your application and process design requirements.

Our deliverables for the engineering can include:

- GA drawings,
- Detailed engineering drawings,
- Drawings as built,
- 3-D models (solid works, Auto CAD),
- Design calculations,
- FEA studies.

Before leaving the factory, 100% of our filter housings are hydro-tested at a pressure rate with a safety coefficient in accordance with the design code. This pressure rate supersedes the operational pressure the cartridge filter housing is designed for to operate under in the field and thereby guarantees an optimum safety and service under pressurized conditions for the lifetime of the filter housing.

C. MANUFACTURING

The filament winding process used for our cartridge filter housing consists of winding continuous rovings of fiber onto a rotating mandrel in predetermined patterns. This method of manufacturing provides us the greatest control over fiber placement and uniformity of structure, something essential for the correct formation of our strong reinforced tubes that serve as the spine of our filter housings.

After several layers are wound, the component is cured and removed from the mandrel (or in some cases the mandrel becomes part of the component).

Filament winding process

The manufacturing procedure for the cartridge filter housing shell is done by filament winding whereas all the structural parts and flanges are done by manual lay-up.

The same manufacturing facility used for the fabrication of our cartridge filter housings has a solid and proven track record of pressurized FRP products for the water treatment and desalination industry.

For painting of the painting of external surfaces we apply the following process, and can also confirm compliance with your specifications:

- Degreasing and cleaning of external surface,
- Applying a primer based on epoxy polyamide thickness 50µm,
- Applying a finish coat based on polyurethane thickness 50µm, weather resistant,
- Color RAL 3024 (red), other colors are available upon request.

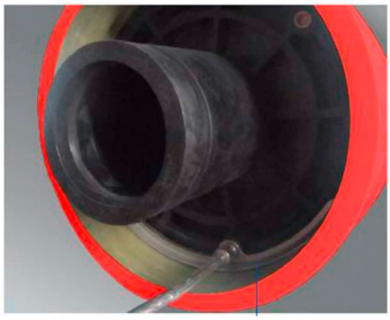
Our deliverables that will support our manufacturing can include:

- Detailed Project Management Planning (time schedule),
- Manufacturing Procedure, Inspection & Test Plan (ITP),
- Material Certificates,
- Third Party Inspection Certificates,
- Dimensional Control & Test Reports,
- Qualifications of Welders & Laminators.

D. SELECTED FILTER HOUSING

Item #	Style	Reference	Description	Design Flow	QTY
1	HV-Q	HH-Q-PCF-1-40	Model HH-Q-Style PCF 1-40, FRP housing for 1 high flow cartridges of 40" length with a design pressure of 10 bar	40 m3/hr	1

Our filter housing is specially designed for a service life time of 25 years in a harsh corrosion environment. Therefore all the wetted components are designed and manufactured of non-corrosive materials like FRP, PP, PVC, and the like. As mentioned, the filter housings main body and component material is the fiberglass reinforced polyester, as it provides the best protection against corrosion and the lowest fees in terms of operation and maintenance costs.



Guide plate and Deflector plate

The bag filter housing is provided with a deflector plate after the inlet and made of FRP and as an integral part of the cartridge filter. Its function is to protect the bag elements by avoiding a direct impact of the water and assuring an equal flow distribution throughout the entire filter.

Furthermore a guide plate is installed to assure perfect cartridge alignment and separation and easy assembly.

Opening System (Q-Style)

The filter housing are provided with an innovative mechanism for easy and fast opening of the lid (see picture beside), even with frequent cartridge replacements. No external bolting on the flange are required and no metal component come in touch with the water.

Piedmont Coupling Connection (or equivalent)

Although we can provide flanged connections if desired, our standard filter housings will be designed for the use of Piedmont Couplings (or similar) for a more economic and easier connection to your piping (see picture on the right above).

E. CARTRIDGE ELEMENTS AND CONNECTIONS

HH-Q-Style Cartridge Connection with internal support for high flow element:

The high flow pleated cartridge elements with OD6" and L=40" are with a single open end (SOE) and are supported by specially designed support made of PP material. The cartridge elements are sealed against the tube sheet plate by means of an O-ring gasket.

F. MECHANICAL DATA SHEET OF PROPOSED FILTER HOUSINGS (RO SERVICE)

	Description	ITEM 1
PROJECT	Project	
	Number of Filter housings	1
	Manufacturer	Piedmont
	Style	HV-Q
	Model Reference	PCF-1-40
MATERIAL OF CONSTRUCTION	1. Shell & cap / Main body	FRP
	4. Inlet flange	FRP
	5. Outlet flange	FRP
	6. Air vent	FRP
	7. Clean drain	FRP
	8. Deflector plate	FRP
	9. Tube sheet	PVC/FRP

	10. Guide plate	PVC/FRP
	11. Lifting lugs	FRP
	13. Main body gaskets	EPDM
	15. Support rod	PA + FRP
	16. Cartridge element	PP
	17. Dirty drain	FRP
	18. O-ring support plate	PVC
	19. Structural plate	FRP
	20. Securing plate	PP
	21. Locking rings	PP
PROCESS CONDITIONS	Design Temperature	60
	Nominal Design Pressure	10.0 bar
	Test Pressure	13.0 bar
	Design Flow	130 gpm
	Velocity at Outlet Flange	1.8 m/s
	Clean Pressure Drop	0.350 bar
	Change Out Pressure Drop	2.10 bar
	Max. Pressure Drop	2.50 bar

CARTRIDGE FILTER (**)	Cartridge Element Length	40"
	Number of Cartridge Elements	1
	Material of Elements	PP
	Cartridge OD	6.0"
	Manufacturing Type of Element	High Flow - Pleated
	Connection Type	SOE
	Micron Rating	5 µm (β ratio 5000)

4. COMMERCIAL CLARIFICATIONS

Commercial T&Cs will be discussed once the technical aspect of the proposal has been accepted by Canadian Water Technologies.

Piedmont

5. LIMITED WARRANTY AND STANDARD TERMS AND CONDITIONS

The warranty described hereinafter covers products manufactured by Piedmont Pacific Corporation ("**Supplier**"), such as couplings, fittings and filter housing ("**Products**") and sold by Supplier, directly or through one of its authorized distributors, subject to the terms and conditions set forth hereunder.

1-Warranty

Subject to the terms and conditions set forth hereinafter, Supplier warrants to the original purchaser ("**Purchaser**") that the Products are free from manufacturing defects for a period of eighteen (18) months after installation or twenty four (24) months after delivery ("**Warranty Period**") of the Products to Purchaser, which even happens first, only when used in normal conditions of operation in accordance with Supplier's instructions or recommendations and within the range of operating conditions specified by Supplier. This warranty does not extend to parts or components manufactured or incorporated by a third party and not forming part of the Products when Purchaser has acquired it from Supplier or one of its authorized distributors.

2- Warranty Service

Supplier's obligation under this warranty is limited to replacement of the Products that prove to have a manufacturing defect within the Warranty Period.

Prior to returning any Products, Purchaser shall obtain Supplier's authorization. Shipment expenses of the Products are at Purchaser's charge. Supplier shall determine, after examination of the Products, of whether returned Products are defective or not. Replacement Products shall be returned by freight. If Supplier determines that returned Products have no manufacturing defect or that the warranty is considered void in accordance with Section 3 hereto, Supplier shall notify Purchaser accordingly.

3- Avoidance of Warranty

This warranty shall be void and unenforceable with regard to any Products that have been damaged by accident, mishandling, abuse nor unprotected storage, or that have been repaired, modified, altered, disassembled or otherwise tampered with by anyone other than Supplier or its authorized representative, or if any replacement part or component not authorized by Supplier has been used, or if Products have not been installed, used, operated or maintained in accordance with the operating documentation and Supplier's instructions and recommendations and within the range of operating conditions specified by Supplier.

4- Limitations and Exclusions

This warranty and the remedies described herein are exclusive and in lieu of any or all other warranty or remedies, expressed or implied, including without limitation any implied warranty of merchantability or fitness for a particular purpose. In no event shall the Supplier be liable for any consequential, incidental or other similar types of damages, or for damages for the loss of production or profits, or for injury to persons or property. No person has the authority to bind the Supplier to other than what is set forth above.

* * * * * * * * * * *

Piedmont

Standard Terms and Conditions

1. ACCEPTANCE AND COMPLETE AGREEMENT. The parties agree that these terms and conditions ("**Terms and Conditions**") are the exclusive and complete terms accompanying any purchase order ("**PO**") related to products sold by Piedmont Pacific Corporation ("**Piedmont**") and no other terms will be deemed relevant to explain or supplement the Terms and Conditions whether oral, written, based on usage of trade, or course of dealing. In case of contradiction between the terms and conditions stated in the PO and these Terms and Conditions, the terms and conditions stated in the PO shall prevail.

2. SCOPE OF WORK. Piedmont agrees to sold to its client ("**Client**"), who agrees to purchase, such products described in the PO (the "**Products**"), subject to the Terms and Conditions hereof.

3. PRICE, PAYMENT AND DELIVERY. Client shall pay Piedmont for the Products, in accordance with the prices and payment terms detailed in the PO to which these Terms and Conditions are attached. Unless otherwise indicated in the PO, Products are priced and shipped INCOTERMS 2012 EXWORKS Piedmont's facility located in Vista, California. Delivery date of the Products is mentioned in the PO. Unless otherwise agreed upon by the parties, payment terms are net thirty (30) days from the date of invoice. Any tax, fee or charge of any nature whatsoever, imposed by any governmental authority on or measured by any transaction between Piedmont and Client, shall be paid by Client in addition to the prices quoted or invoiced. If Piedmont shall be required to pay any such tax, fee or charge, Client shall forthwith reimburse Piedmont.

4. STATUS. Upon demand, Piedmont shall inform Client as to the status of the PO to assure delivery of the Products by the time required in the PO. Piedmont will take the steps it deems necessary to expedite production and/or shipment of the Products in order to deliver them in due time.

5. COMPLIANCE WITH LAWS. The parties shall comply with all applicable laws and regulations including, but not limited to, export control laws and anti-corruption laws pertaining to bribery, extortion, kickbacks or other unlawful or improper means of obtaining business whether directly or indirectly. Each party shall reasonably cooperate with the other regarding any claim or proceeding and indemnify the other for any act or omission thereof.

6. WARRANTY. Piedmont warrants to the Client that the Products are free from manufacturing defects for a period of twelve (12) months from installation or eighteen (18) months from delivery, whichever occurs first ("**Warranty Period**"), only when used in normal conditions of operation in accordance with Piedmont's instructions or recommendations and within the range of operating conditions specified by Piedmont. This warranty does not extend to parts or components manufactured or incorporated by a third party and not forming part of the Products when Client has acquired it from Piedmont or one of its authorized distributors.
Piedmont's obligation under this warranty is limited to replacement of the Products that prove to have a manufacturing defect within the Warranty Period. Prior to returning any Products, Client shall obtain Piedmont's authorization. Shipment expenses of the Products are at Client's charge. Piedmont shall determine, after examination of the Products, of whether returned Products are defective or not.
Replacement Products shall be returned by freight. If Piedmont determines that returned Products have no manufacturing defect or that the warranty is considered avoid, Piedmont shall notify Client accordingly. This warranty shall be void and unenforceable with regard to any Products that have been damaged by accident, mishandling, abuse nor unprotected storage, or that have been repaired, modified, altered, disassembled or otherwise tampered with by anyone other than Piedmont or its authorized representative, or if any replacement part or component not authorized by Piedmont has been used, or if Products have not been installed, used, operated or maintained in accordance with the operating documentation and Piedmont's instructions and recommendations and within the range of operating conditions specified by Piedmont. THIS WARRANTY AND THE REMEDIES DESCRIBED HEREIN ARE EXCLUSIVE AND IN LIEU OF ANY OR ALL OTHER WARRANTY OR REMEDIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. In no event shall Piedmont be liable for any consequential, incidental or other similar types of damages, or for damages for the loss of production or profits, or for injury to persons or property.

7. INDEMNITY. Either party shall indemnify, defend, and hold harmless the other party from and against any and all demands, claims or causes of action of every kind and nature, arising out of or related to the Products provided under this PO, including but not limited to liabilities attributable to personal injury, death, loss of use, or property damage, to the extent caused by the negligence or fault, breach or violation of a statute, ordinance, governmental regulation, standard, or rule, or breach of contract of or by such party, its agents, employees, or subcontractors of any tier. Except for liability due to gross negligence or wilful misconduct or for liabilities attributable to personal injury or death, the indemnity obligation shall be limited to the aggregate value of the PO.

8. INSURANCE. Prior to commencement of the Work and at all time during the term of the Agreement, Piedmont shall obtain and maintain, at its own cost, sufficient insurance coverage for commercial general liability, workers compensation liability and employer's liability. A proof of insurance shall be provided to the Client upon demand.

9. SUSPENSION AND STORAGE. In the event that the Client is requiring an interruption in the work schedule or is not ready or able to accept receipt of the Products after confirmation from Piedmont that the Products are ready to be shipped, Piedmont will keep the Products in storage for a period of 30 days at no charge. After such 30 day period, Piedmont shall be entitled to (i) invoice and obtain payment for all costs and expenses already incurred into the project as of the date of suspension as well as all costs and expenses resulting from such suspension, (ii) charge interest at a rate of 18% per year on retention amount, if any, and (iii) charge storage fees of $2.50 per square foot of occupied space per month.

10. TERMINATION. This agreement may be terminated before delivery of the Products as described below:

a. by Piedmont, without notice, upon the occurrence of an event of default, each of the following constitutes an event of default for the purposes of the PO:
   i. Client is adjudged bankrupt, or a receiver is appointed on account of its insolvency or it enters into an arrangement for the benefit of its creditors,
   ii. Client persistently fails to pay for the Products as required, or
   iii. Client otherwise fails to perform or comply with any material term, condition or covenant of the PO, being understood and agreed that in case of termination for default, Piedmont shall be entitled to receive compensation in an amount equal to one hundred percent (100%) of the amount of the PO; or

b. by Piedmont, for any reason at any time, by giving Client seven (7) days' written notice of termination, being understood and agreed that in such case of termination, Piedmont shall receive compensation in an amount equal to one hundred percent (100%) of the Products delivered to Client as of the date of termination; or

c. by the Client, for any reason at any time, by giving Piedmont seven (7) days' written notice of termination, being understood and agreed that in such case of termination, Piedmont shall receive compensation in an amount equal to one hundred percent (100%) of the Products delivered to Client as of the date of termination plus twenty percent (20%) of all amounts paid, up to a maximum of one hundred percent (100%) of the amount of the PO.

11. FORCE MAJEURE. Neither party shall be responsible for delays or failures in performance resulting from events or circumstances beyond the control of such party. Such events shall include, but not limited to acts of God, strikes, lockouts, riots, acts of war, epidemics, governmental acts or regulations, fires, communication line failures, power failures and earthquakes.

12. CONFIDENTIALITY. Each party acknowledges that these Terms and Conditions as well as the terms and conditions of the Agreement are confidential and shall be maintained as confidential and not disclosed to any others. The obligations of confidentiality shall continue for the term of the Agreement and shall survive indefinitely thereafter.

13. ASSIGNMENT. Client may not assign the Agreement, without prior written consent of Piedmont.

14. TIME OF ESSENCE. Time is of the essence.

15. CONSEQUENTIAL DAMAGES. Notwithstanding any other provision herein, neither party shall be liable to the other party or to any third party for any special, indirect, consequential, incidental or punitive damages, including without limitations, loss of profit, contracts or, business revenues.

16. CHANGE ORDER AND AMENDMENT. The parties acknowledge and agree that the Work is subject to change. The estimate of costs and time for completion of the Work may be modified subject to changes and is contingent upon factors beyond the control of Piedmont. No supplement, modification, waiver or termination of the Agreement shall be binding unless executed in writing by the parties to be bound thereby. No waiver of any of the provisions of this agreement shall be deemed or shall constitute a waiver of any other provision (whether or not similar) nor shall such waiver constitute a continuing waiver unless otherwise expressly provided.

17. GOVERNING LAWS. This PO shall be governed by and construed in accordance with the laws of the State of California applicable therein. All disputes shall be resolved by the courts of the State of California and the parties consent to such jurisdiction and waive any other.

FILTER CARTRIDGE

PLEATED HIGH FLOW ELEMENT PL SERIES

Piedmont High Flow Pleated Filter Cartridges are especially designed for high flow filtration applications and will replace many brands such as: Amazon, Global filter, ASCO filter, Filtrek & Pall Ultipleat. Unique rigid hard cage as outer case enables the High Flow filters to undertake large differential pressures during the filtration process.

Larger diameter with less filter elements, but more filtration surface area leads to higher flow rateand longer service life. Both CAPEX and OPEX can be reduced.

Suitable for various applications like RO-pretreatment, condensate filtration, seawater, desalination and (petro)chemical and pharmaceutical applications.

FEATURES

- **Deep pleated structure with multiple filtration media**
- **High dirt holding capacity**
- **Ultimate retention efficiency**
- **Inside-out flow to hold most debris in**

Cartridge Dimensions	
Removing Ratings (Absolute)	1, 3, 5, 10, 20, 40 µm and others available
Surface of filtration	7.98 m^2 / 85.90 ft^2
Outside Diameter	6 inches / 152 mm
Length	40 inches / 1 016 mm, 60 inches / 1 524 mm

Material of construction	
Filter Media	Depth Type Multimedia Polypropylene
Core Material	Polypropylene
End Cap Material	Rigid Hard Cage
Support Layer Material	Polypropylene
Gasket / O-ring Material	EPDM / VITON

Operating Conditions	
Maximum Operating Temperature	180 °F / 82°C
Maximum Flow Rate	40'' : 343gpm / 78 m^3 / hr 60'' : 500gpm / 113m^3 / hr
Recommended Change-Out Differential Pressure	30psid @68 °F (2.1bar @ 20 °C)

FILTER CARTRIDGE
PLEATED HIGH FLOW ELEMENT PL SERIES

Piedmont High Flow Cartridge Ordering Guide				
Cartridge Design	**Cartridge Length**	**Material (Media / Plastic Components)**	**Removal Rating (Nominal Micron)**	**O-ring Material**
Max Pleated PL Series	40 – 40 ” (1,016 mm) 60 – 60 ” (1,524 mm)	PP – Polypropylene Micron Fiber Media	P010– 1 µm P030– 3 µm P050– 5 µm P100– 10 µm P200– 20 µm P400– 40 µm	E=EPDM V=Fluororubber S=Silicon N=Buna-N rubber

Features and Benefits

High flow capacity up to 500 gpm per cartridge
- Reduced Filter Usage - minimizes product loss, labor cost, disposal costs, operator exposure and downtime for filter change-out.

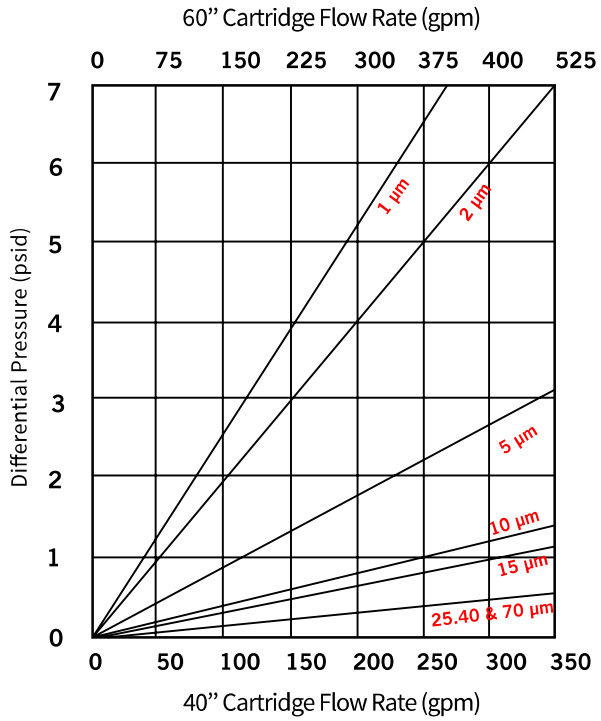
Absolute rating
- Reproducible effluent quality throughout the filter’s life.

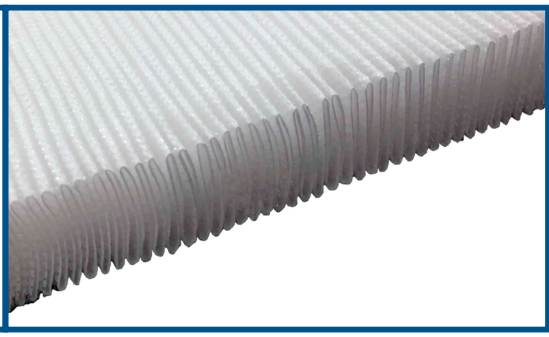
Pleated design
- Larger usable filtration surface area, higher dirty holding capacity longer life time.

Supporting core design
- Strengthen filter cartridge, easy to change.

Easy to use
- No special tools or hardware required for filter change-out - minimizes downtime
- Handle design - facilitates easy cartridge installation and removal

Typical Cartridge Flow Rates





UV Systems

DILLON CONSULTING

VIQUA™

simply safe water

PRO50

520374-R_RevA

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PREFACE

Contact Information

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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 PRO50 system. The PRO50 system is a USEPA UVDGM 2006 protocol certified system ideal for regulated markets and is suited for light commercial applications.

1.0 PROJECT & SYSTEM DESCRIPTION

1.1 Project Description

Project Name		Guidelines
		PRO50
Maximum flow rate		50 GPM
Design dose (@ 95% UVT)		40 mJ/cm^2
Operating pressure		15 psi (103 kPa) – 125 psi (861 kPa)
Ambient air temp.		0°C (32°F) - 40°C (104°F)
Ambient water temp.		1°C (34°F) - 45°C (113°F)
Hardness		120 ppm (7 grains / gallon) max.*
Manganese content		0.05 ppm max.*
Iron content		0.3 ppm max.*
UVT		85% min.*

*after pretreatment

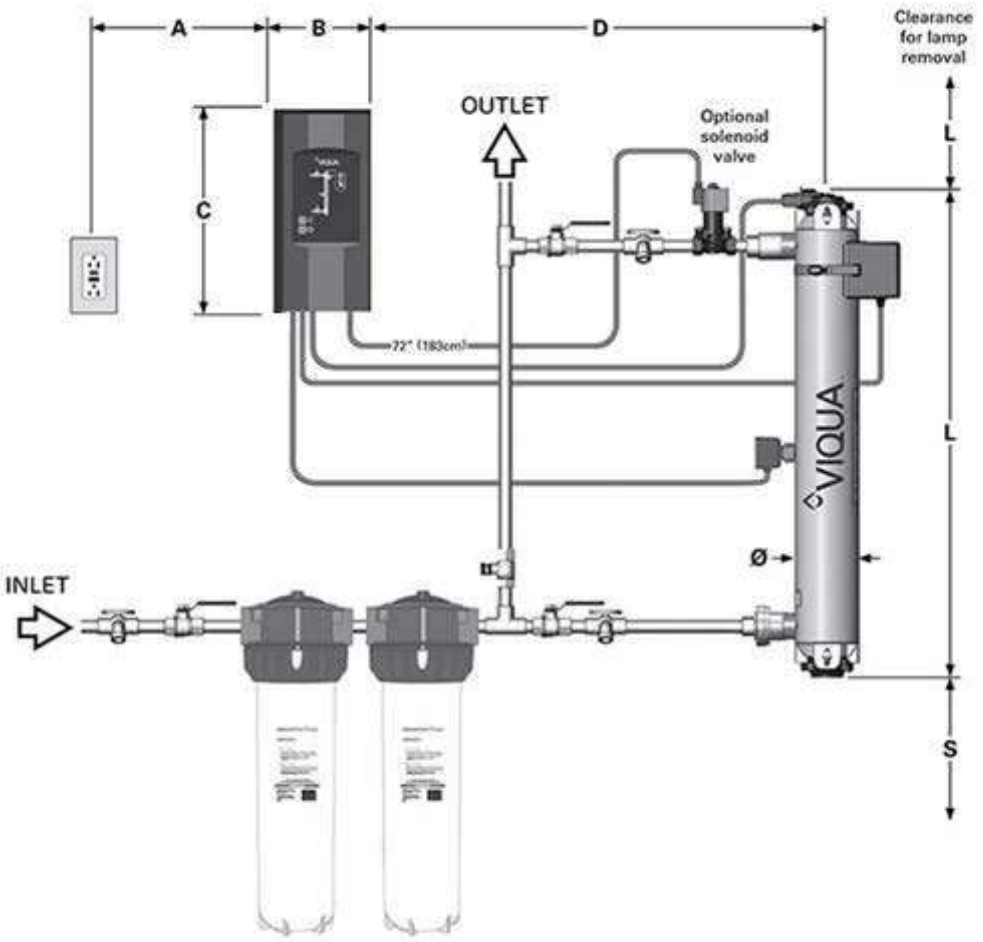
1.2 System Description

Model	PRO50
Quantity	
Chamber	
Material	316L SST
Dimensions	41” x 4” (103 x 10 cm)
Inlet & outlet ports	2" MNPT
UL Certified burst pressure	300 psi (3.45 MPa)
Orientation	Vertical
Electrical	
Power Supply	13” x 6.5” (33 x 16.5 cm)
Voltage	100 - 240 V AC
Frequency	50 - 60 Hz
Max. current	2.5 Amps
Max. power consumption	230 Watts
Lamp power	200 Watts

Spare Parts	Quantity	Optional Accessories	Quantity
Lamps		Solenoid valve	
Sleeves		COMMcenter™	
CoolTouch™ Fans		4-20 mA Interface	
UV sensors			

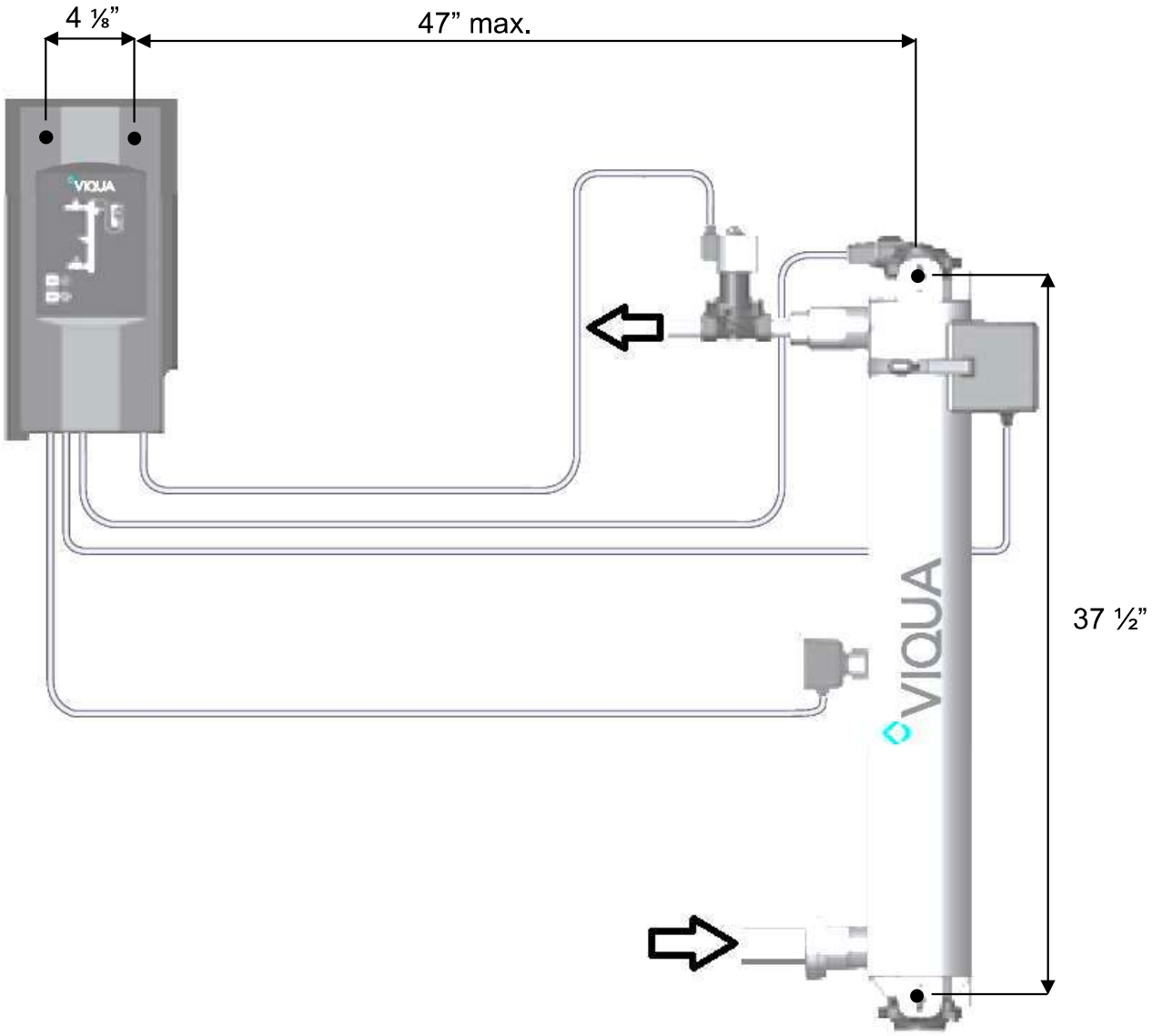
2.0 PRODUCT DRAWINGS

2.1 Install Diagram

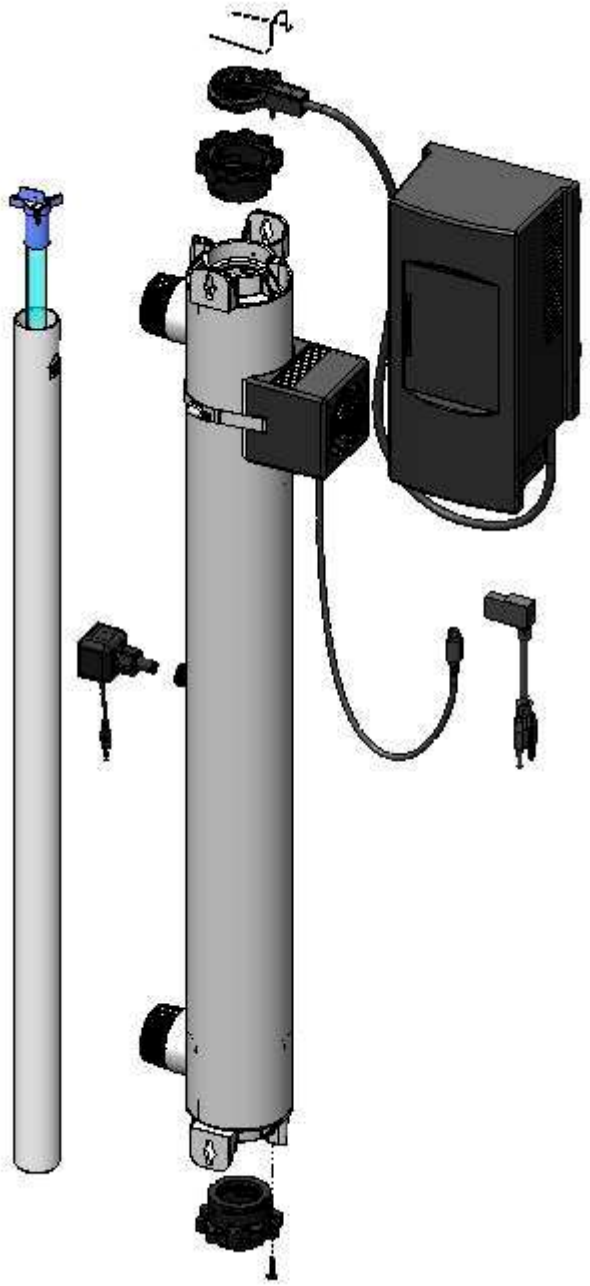


Item	L	S (min.)	Ø	A (max.)	B	C	D (max.)
PRO50	41” (103cm)	12” (30cm)	4” (10cm)	72” (182cm)	6.5” (16.5cm)	13” (33cm)	48” (122cm)

2.2 Mounting Diagram



2.3 Exploded View

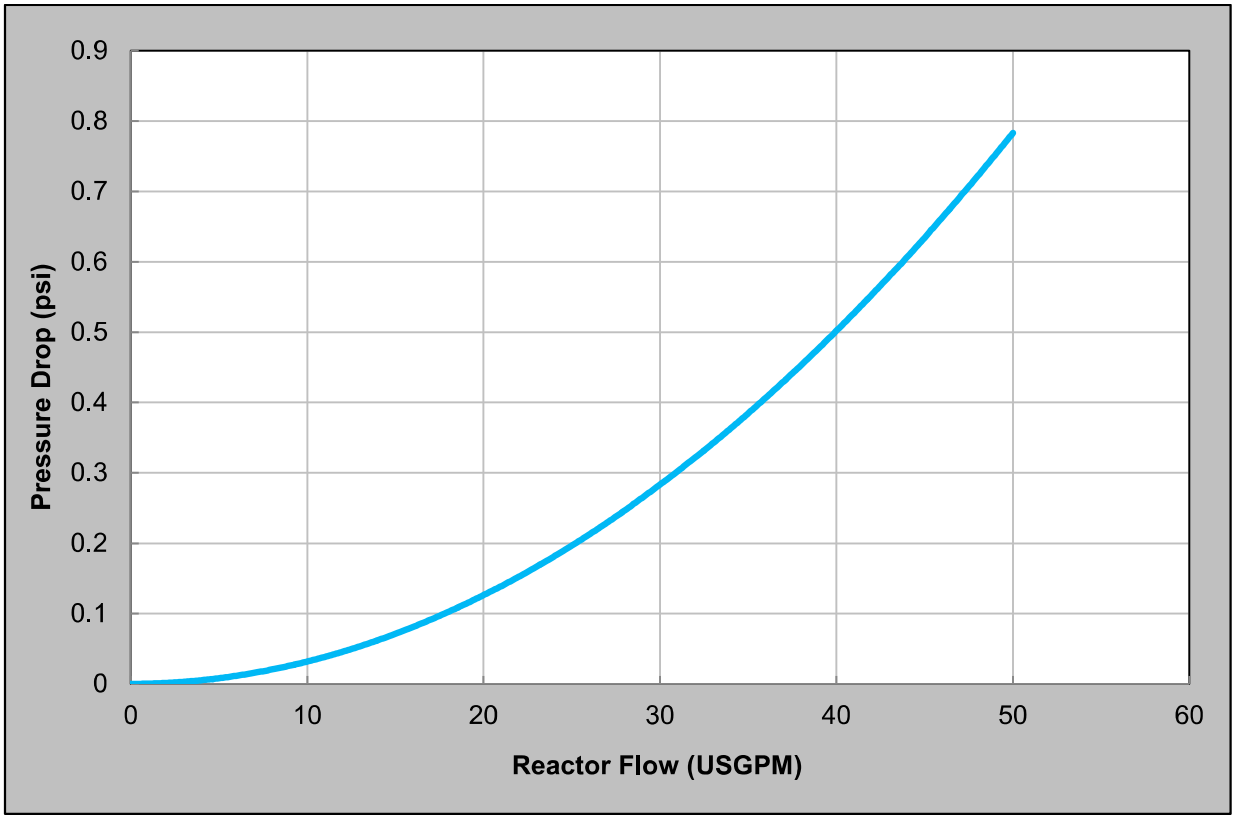


Refer to .pdf and .step files for engineering drawings and part numbers.

3.0 SYSTEM OVERVIEW

3.1 Pressure Drop

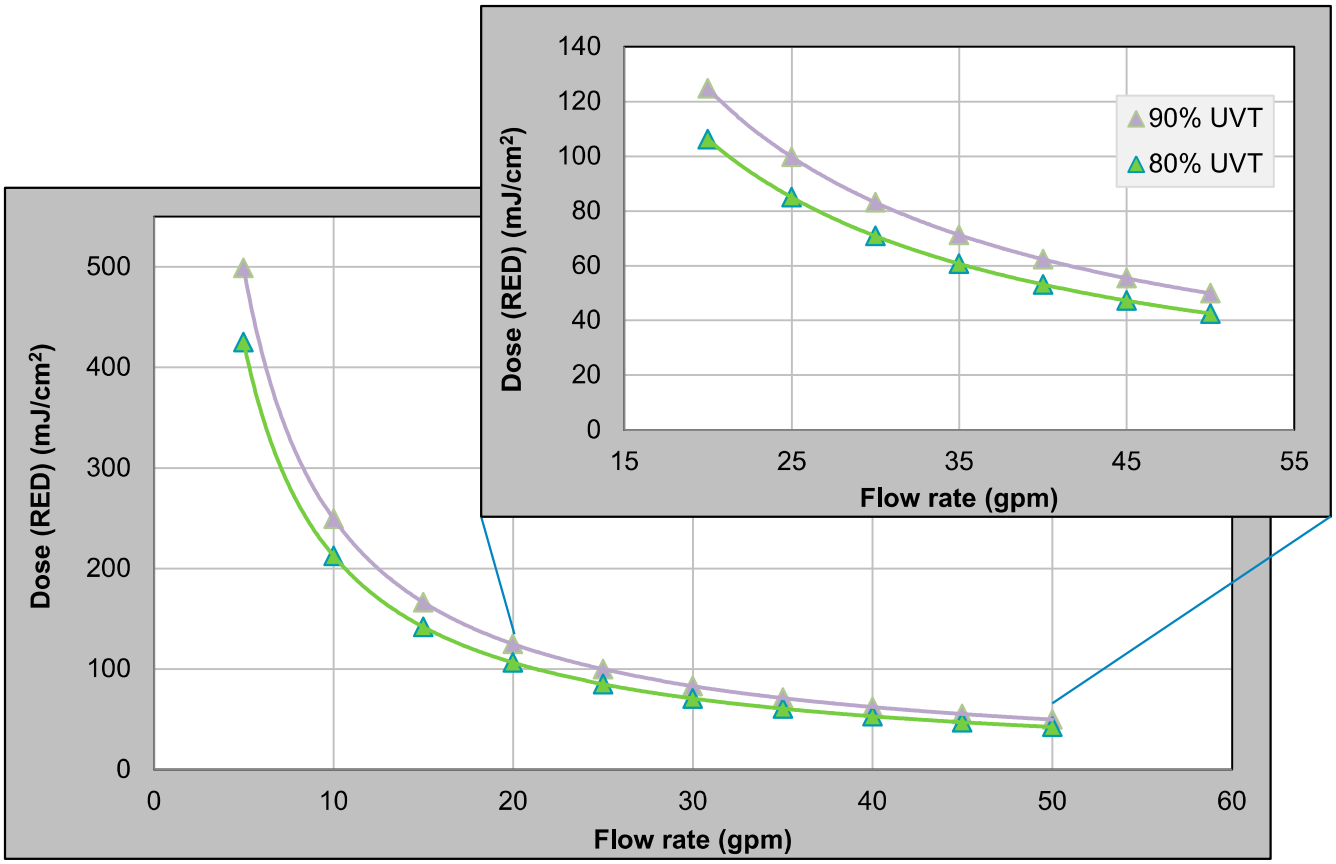
The pressure drop across the system is proportional to the flow through the system.



3.2 Dose Curves

Flow rate, UVT, and required UV dose conditions dictate which system is appropriate for a given location.

Dose values such as those in the following graph are calculated based on set-points. Set-point conditions are determined by third party verified bioassay testing completed in compliance with the 2006 UV Disinfection Guidance Manual (UVDGM).

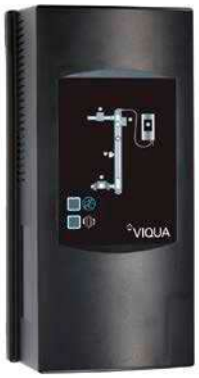


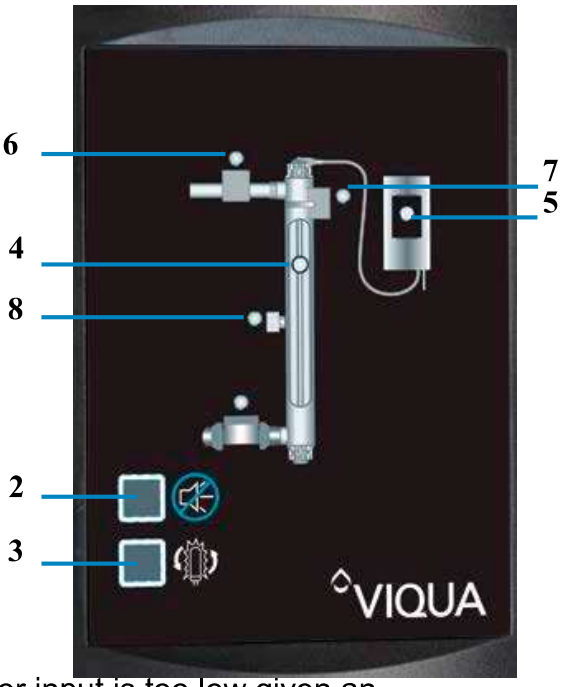
There is no flow restrictor or flow meter available for the PRO50 system; therefore, users may consider employing some external method to measure and control flow to ensure the maximum design flow is not exceeded.

3.3 Controller Interface

The controller is equipped with the following features:

1. Audible alarm
2. Audible alarm mute
3. Replacement lamp counter reset
4. Lamp operation indicator
5. Controller operation indicator
6. Solenoid valve operation indicator
7. Fan operation indicator
8. Sensor reading indicator





Controllers will enter audible and visual alarm if the sensor input is too low given an assumed maximum flow of 50 GPM or the maximum flow predicted and set by the user on the CommCenter™. The PRO50 does not monitor or control real time flow rates, this must be controlled externally.

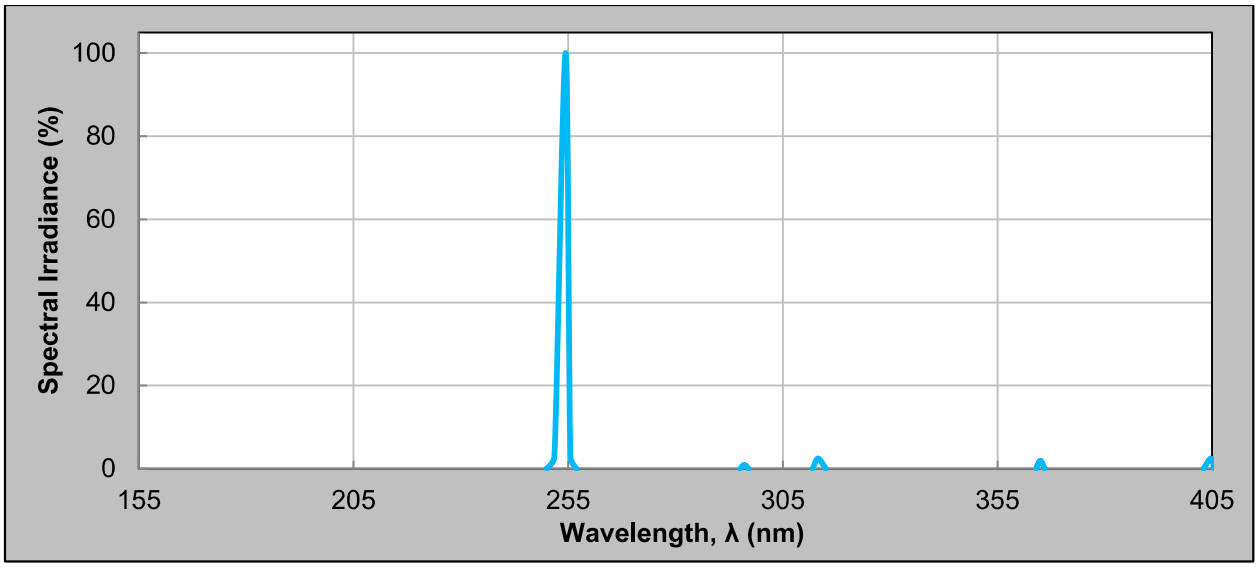
Features

- Continuously monitors dose based on assumed flow and measured dose rate
- Communicates minor and major audible alarms when operation falls outside the USEPA UVDGM prescribed operating range
- Auto-ranging
- Constant Current

3.4 UV Lamp

3.4.1 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 PRO50 system amalgam lamps have a mercury content of less than 15 mg (IMERC registered).



VIQUA's amalgam lamps use a mercury amalgam matrix as opposed to mercury in its pure liquid form. Therefore, the mercury is contained as a secure, solid segment. Additionally, this segment is trapped in a compartment at the bottom of the lamp.

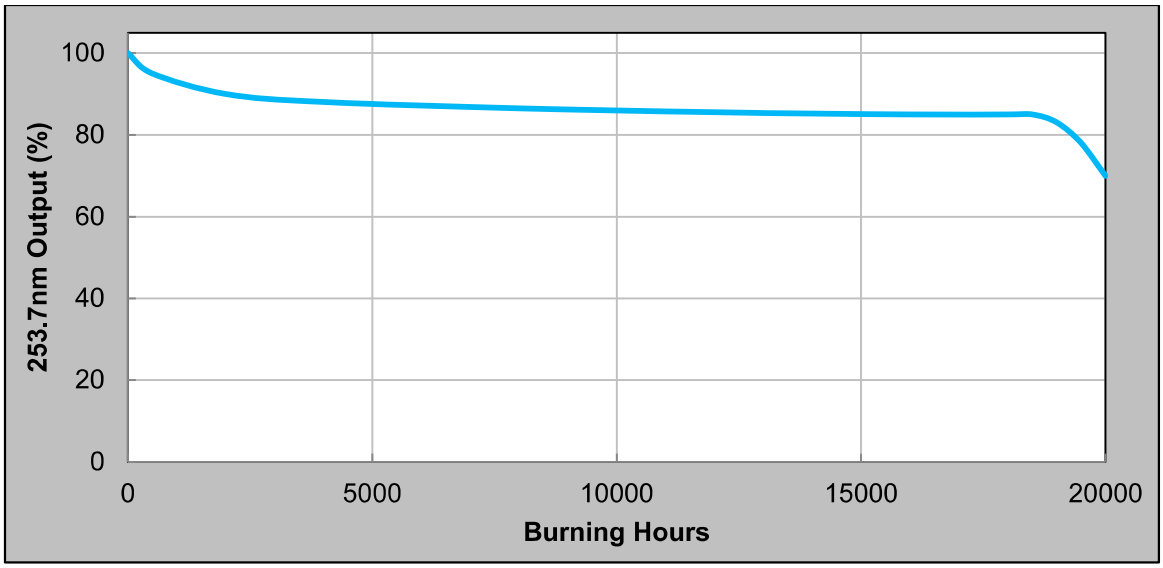
In the case of a broken lamp, this compartment would contain the mercury. Even if this compartment also broke open, the quartz sleeve prevents the mercury from coming in contact with water.

Features

- All electrical connections made at one end of the lamp
- Lamp base features a diabolic barrier which prevents arcing between pins

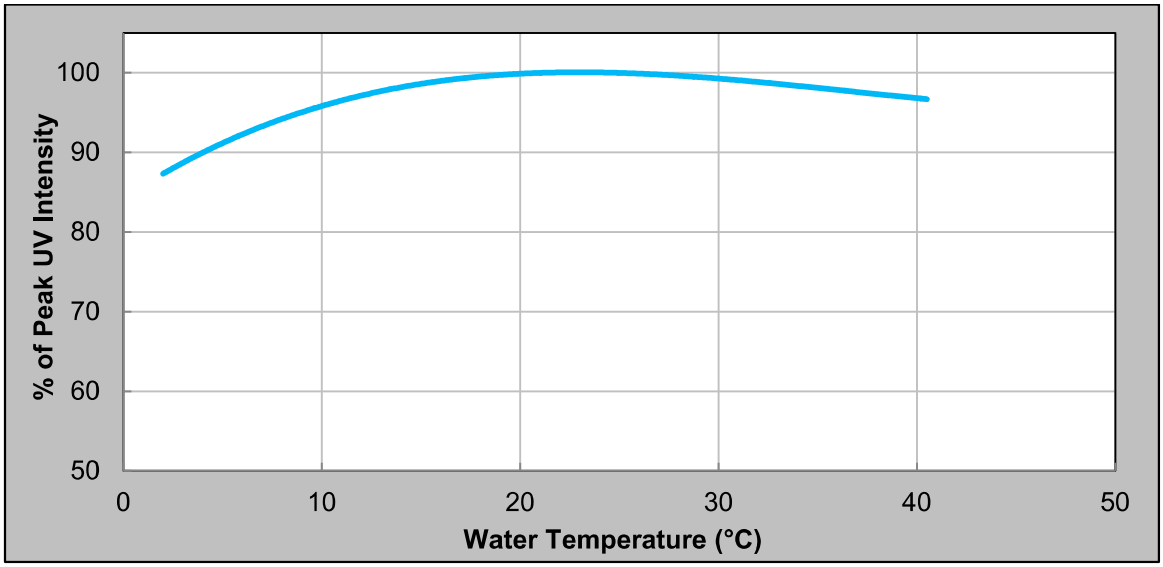
3.4.2 Degradation Chart

Amalgam lamps have a useful life of approximately 18,000 hours. They can provide adequate disinfection for up to two years and then require replacement.



3.4.3 Temperature Profile

VIQUA's lamps use a mercury amalgam mix to control the vapour pressure and produce a more stable output than conventional standard output lamps.

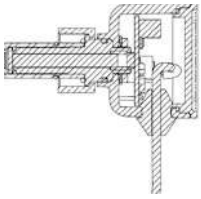


3.4.4 Quartz Sleeve

The UV lamp is enclosed by a quartz sleeve made of GE Type 214 or equivalent clear fused silica quartz. Overtime, mineral deposits will 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, and rust remover.

3.5 UV Sensor

Many factors influence a system's level of UV disinfection. Some of these factors include water quality (primarily UVT), lamp output, and quartz sleeve fouling. Rather than base set-points on any one of these factors, alarm 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 purified properly as a result of change in any factor and sends a 4-20 mA output signal to the controller. VIQUA's UV sensors reliably detect low UV output and identify the need for maintenance.

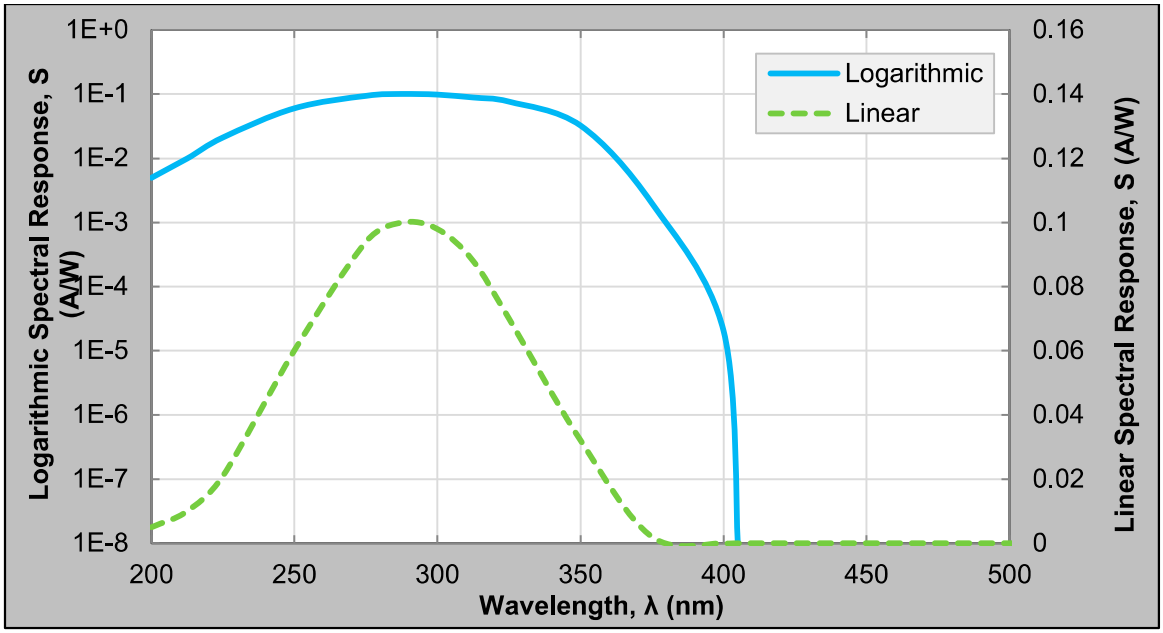


Features

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

3.5.1 Sensor Response Curve

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



3.6 Signals and Remote Capabilities

3.6.1 COMMcenter™

The COMMcenter™ provides live monitoring and records past performance. When a Mini-SD card is inserted into the system, information is recorded every minute. A 512 MB Mini-SD card should store 18 years-worth of data. Without the Mini-SD, the COMMcenter™ will store the last 40 alarms that have occurred in memory.

Features

- Notifies alarm situations and provides help screens to overcome the problem
- Archives past performance, water quality changes, power failures, alarms, and lamp age.
- RJ45 Ethernet cable connection between COMMcenter™ and controller.
- Equipped with a 2 GB Micro-SD card and Mini-SD adapter.

3.6.2 Dry Contacts

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

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)		

3.6.3 4-20 mA Interface

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.

4.0 CERTIFICATIONS

PRO50 systems are tested and certified to USEPA UVDGM 2006 standards. Additionally, PRO50, K, and K+ systems are tested and certified to UL, CE, RoHS, and Low Lead standards.

5.0 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	five (5) years from the date of purchase
UV Lamps, Sleeves, and UV Sensors	one (1) year from the date of purchase

VIQUA
simply safe water

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

Frank Profiti
General Manager
VIQUA

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E-mail: info@viqua.com
www.viqua.com

Truckfill Pumps

DILLON CONSULTING

P-02 Distribution Pump

GRUNDFOS

Company name:
Created by:
Phone:

Date: 7/12/2018

Position	Count	Description
	1	**CR 15-1 A-GJ-A-V-HQQV**

Product No.: 96523628
Vertical, non-self-priming, multistage, in-line, centrifugal pump for installation in pipe systems and mounting on a foundation.

The pump has the following characteristics:
- Impellers and intermediate chambers are made of
- The shaft seal has assembly length according to EN 12756.
- Power transmission is via cast iron split coupling.

The motor is a 3-phase AC motor.

Controls:

Frequency converter:	NONE

Liquid:

Pumped liquid:	Drinking water
Liquid temperature range:	-4 .. 194 °F
Liquid temperature during operation:	68 °F
Density:	62.29 lb/ft³
Kinematic viscosity:	1 cSt

Technical:

Actual calculated flow:	90.3 US gpm
Rated flow:	79.3 US gpm
Resulting head of the pump:	19.98 psi
Pump orientation:	Vertical
Shaft seal arrangement:	Single
Code for shaft seal:	HQQV
Approvals on nameplate:	CURUS
Curve tolerance:	ISO9906:2012 3B

Materials:

Base:	Cast iron EN 1561 EN-GJL-200 ASTM A48-25B
Impeller:	Stainless steel EN 1.4301 AISI 304
Bearing:	SIC

Installation:

Maximum ambient temperature:	140 °F
Maximum operating pressure:	232.06 psi
Max pressure at stated temperature:	232 psi / 194 °F 232 psi / -4 °F

GRUNDFOS

Company name:
Created by:
Phone:

Date: 7/12/2018

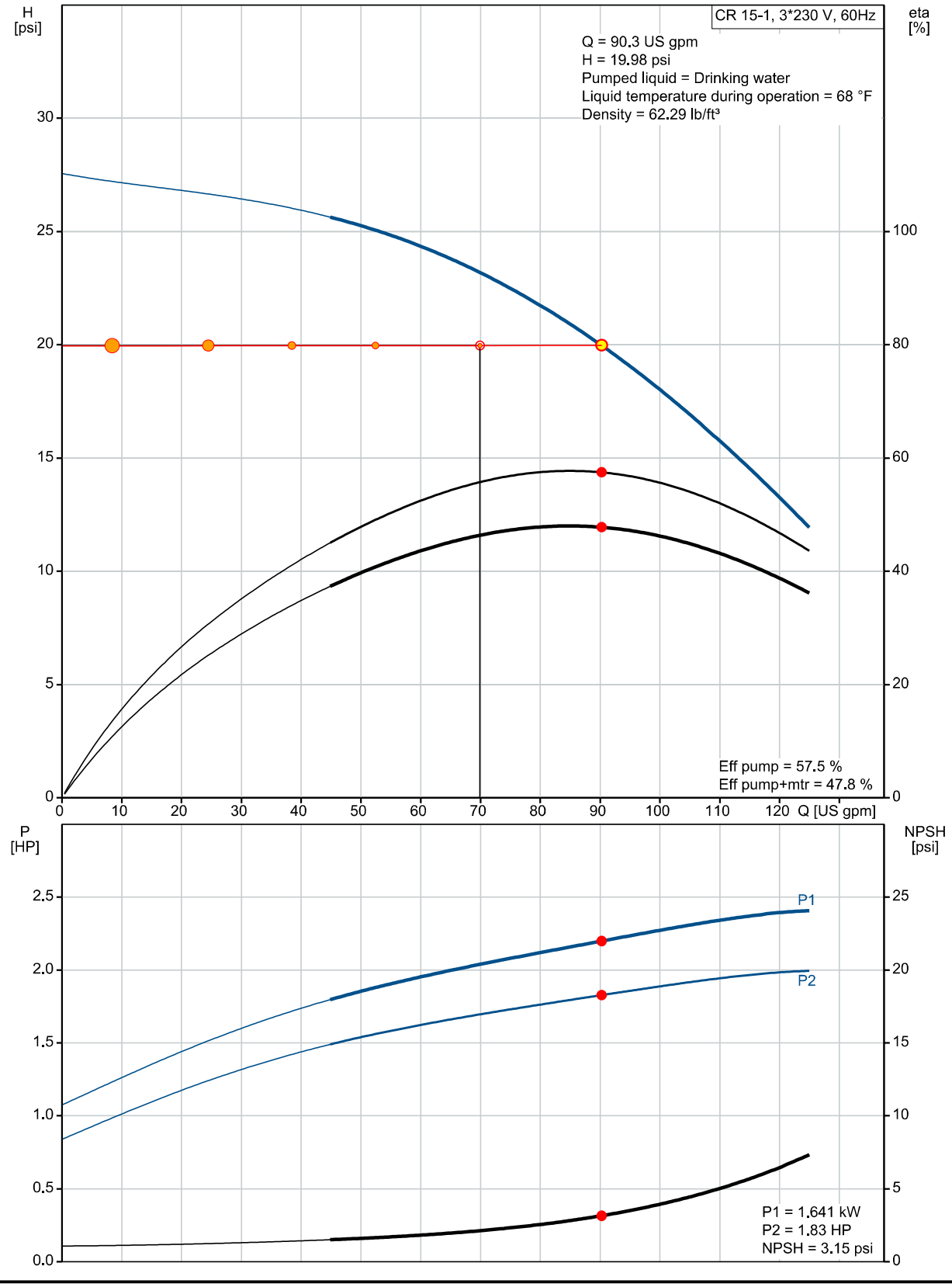
Position	Count	Description	
		Type of connection:	ANSI / JIS
		Size of inlet connection:	DN 50
		Size of suction port:	2 inch
		Size of outlet connection:	DN 50
		Size of outlet port:	2 inch
		Pressure rating for pipe connection:	PN 25
		Flange rating inlet:	300 lb
		Flange size for motor:	56C
		Electrical data:	
		Motor standard:	NEMA
		Motor type:	90CC
		IE Efficiency class:	NEMA Premium / IE3 60Hz
		Rated power - P2:	2.01 HP
		Power (P2) required by pump:	2 HP
		Main frequency:	60 Hz
		Rated voltage:	3 x 208-230YY/460Y V
		Service factor:	1.15
		Rated current:	5,70-5,40/2,70 A
		Starting current:	810-900 %
		Cos phi - power factor:	0.88-0.84
		Rated speed:	3480-3510 rpm
		IE efficiency:	IE3 85,5%
		Motor efficiency at full load:	85.5 %
		Motor efficiency at 3/4 load:	85.0 %
		Motor efficiency at 1/2 load:	83.0 %
		Number of poles:	2
		Enclosure class (IEC 34-5):	55 Dust/Jetting
		Insulation class (IEC 85):	F
		Others:	
		Net weight:	112 lb
		Gross weight:	128 lb
		Shipping volume:	6.11 ft³

GRUNDFOS

Company name:
Created by:
Phone:

Date: 7/12/2018

96523628 CR 15-1 A-GJ-A-V-HQQV 60 Hz

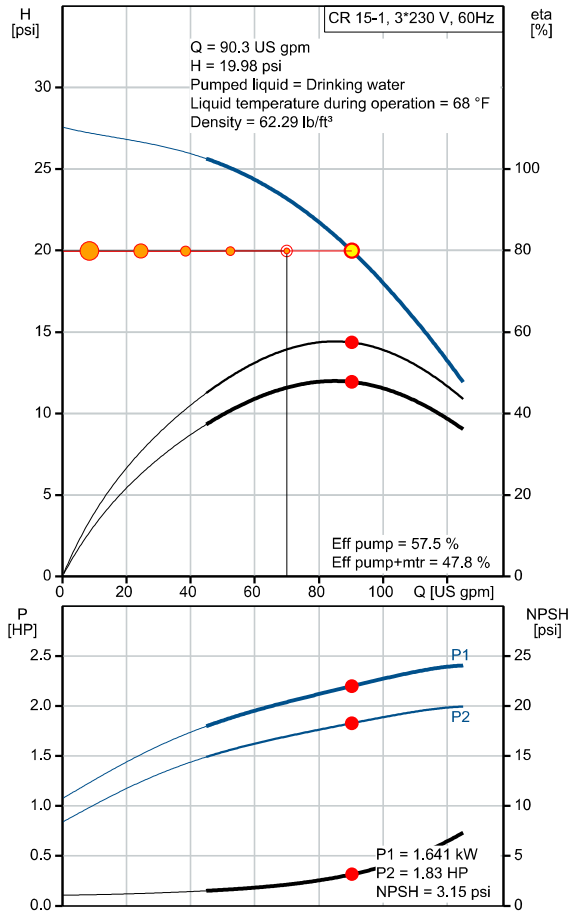


GRUNDFOS

Company name:
Created by:
Phone:

Date: 7/12/2018

Description	Value
General information:	
Product name:	CR 15-1 A-GJ-A-V-HQQV
Product No.:	96523628
EAN:	5700396908502
Technical:	
Actual calculated flow:	90.3 US gpm
Rated flow:	79.3 US gpm
Resulting head of the pump:	19.98 psi
Stages:	2
Impellers:	1
Low NPSH:	N
Pump orientation:	Vertical
Shaft seal arrangement:	Single
Code for shaft seal:	HQQV
Approvals on nameplate:	CURUS
Curve tolerance:	ISO9906:2012 3B
Pump version:	A
Model:	A
Cooling:	TEFC
Materials:	
Base:	Cast iron
	EN 1561 EN-GJL-200
	ASTM A48-25B
Impeller:	Stainless steel
	EN 1.4301
	AISI 304
Material code:	A
Code for rubber:	V
Bearing:	SIC
Installation:	
Maximum ambient temperature:	140 °F
Maximum operating pressure:	232.06 psi
Max pressure at stated temperature:	232 psi / 194 °F
	232 psi / -4 °F
Type of connection:	ANSI / JIS
Connect code:	GJ
Size of inlet connection:	DN 50
Size of suction port:	2 inch
Size of outlet connection:	DN 50
Size of outlet port:	2 inch
Pressure rating for pipe connection:	PN 25
Flange rating inlet:	300 lb
Flange size for motor:	56C
Liquid:	
Pumped liquid:	Drinking water
Liquid temperature range:	-4 .. 194 °F
Liquid temperature during operation:	68 °F
Density:	62.29 lb/ft³
Kinematic viscosity:	1 cSt
Electrical data:	
Motor standard:	NEMA
Motor type:	90CC
IE Efficiency class:	NEMA Premium / IE3 60Hz
Rated power - P2:	2.01 HP
Power (P2) required by pump:	2 HP
Main frequency:	60 Hz
Rated voltage:	3 x 208-230YY/460Y V
Service factor:	1.15



GRUNDFOS

Company name:
Created by:
Phone:

Date: 7/12/2018

Description	Value
Rated current:	5,70-5,40/2,70 A
Starting current:	810-900 %
Load current:	6,55-6,1/3,05 A
Cos phi - power factor:	0.88-0.84
Rated speed:	3480-3510 rpm
IE efficiency:	IE3 85,5%
Motor efficiency at full load:	85.5 %
Motor efficiency at 3/4 load:	85.0 %
Motor efficiency at 1/2 load:	83.0 %
Number of poles:	2
Enclosure class (IEC 34-5):	55 Dust/Jetting
Insulation class (IEC 85):	F
Motor protection:	NONE
Motor Number:	85900705
Controls:	
Frequency converter:	NONE
Others:	
Net weight:	112 lb
Gross weight:	128 lb
Shipping volume:	6.11 ft³