

5K CLASS HYDRO TURBINES

PRODUCT SELECTION GUIDE



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The First Totally New Blade Design in Over 100 Years

FTC Energy worked for over 3 years to get the water turbine blade perfect. We recognized the value of the Pelton wheel, but felt it had limitations. We addressed the limitations with our powerful computer software.

After countless hours of computer and engineering time, we found a better way. The efficiency of harvesting water power was higher, the range of water pressure was expanded, and the ability to handle steam as well as water was enhanced.

The Pelton wheel was invented by Lester Allan Pelton in the 1870s. A Pelton wheel, while good in its day, is like a pair of spoons soldered together. Spoon shapes were used by Pelton because that's what he had.

Using our Computational Fluid Dynamics (CFD) software, we identified where the water was slipping off the spoons when the wheel was under load. The common way to overcome this failing has been to add more nozzles around the wheel.

Our Genetic Algorithm (GA) software worked on the problem and found that by using half cylinders with solid squared ends the water could not slip off the cup area. The CFD software proved the GA software was

correct.

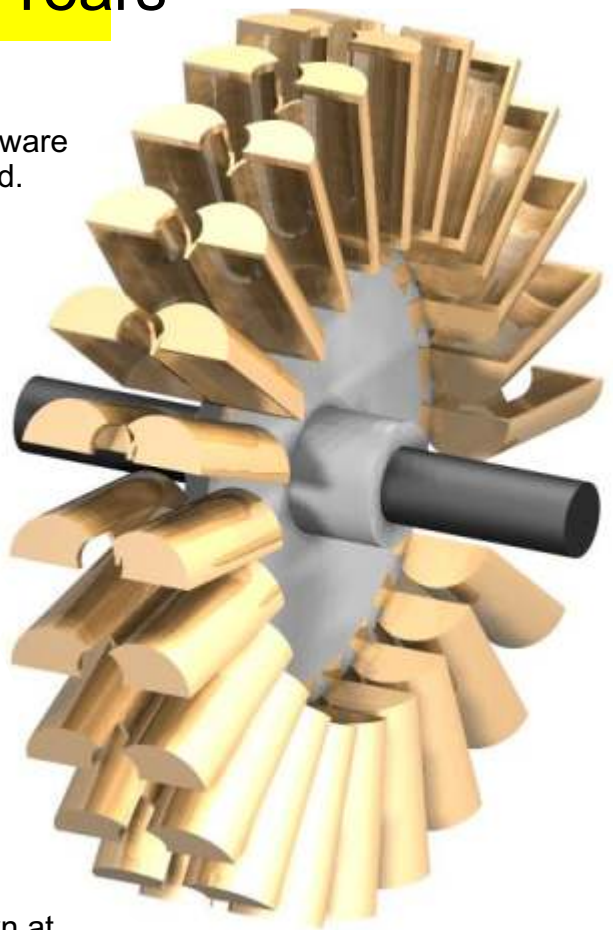
However, software isn't the real world. What looks good on a computer may not work in practice. To know for sure, we used our massive Titan 3D printer to create both an old Pelton wheel and a version of our new design.

To see the difference, look at the cups on our turbine and compare those to the egg-shaped Pelton wheel cups shown at the bottom right. It is quickly obvious why the water slips off the Pelton wheel and does not slip off our design.

We put the two wheels on a single shaft and tested to find which was better. No contest.

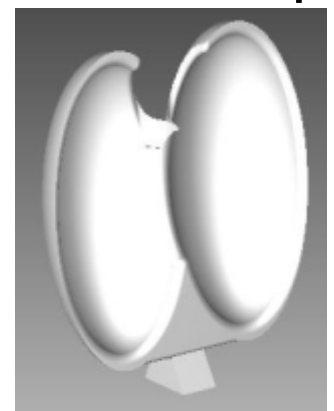
The Pelton wheel worked okay. We measured the torque and the RPM of the Pelton wheel using a fixed water source.

We applied that same water pressure to our new design. The torque shot up and the shaft spun so fast it sounded like a jet engine spooling up.



Under load, our turbine maintained RPM better and delivered much more energy to the shaft. So we filed for a patent.

Pelton Cup



ZERO COGGING GENERATOR

FTC Energy's Water/Steam/Compressed Air Turbines Convert Mechanical Energy to Electricity Efficiently Because of Our Zero Cogging Generators

The term 'cogging' refers to the motion similar to the detents you feel turning the volume dial on a high-end stereo. In a permanent magnet (PM) generator, this cogging happens when magnets in the armature line up with and are attracted to the slots in the stator.

This cogging can be very severe. So severe in fact, that it is hard to turn the generator. Further, the cogging doesn't go away as the generator turns faster. It only worsens and results in extreme vibration, which dramatically shortens the life of the ball bearings.

Another aspect of cogging with permanent magnet generators is that it robs the system of power. If we have a water turbine that drives the generator, a significant part of the energy available is consumed just overcoming the cogging.

Others have given up using PM generators because of cogging and have gone back to the self-exciting generator. A self-exciting generator creates a magnetic field similar to the magnets in a PM generator, but does it electrically. Because

there are no magnets, there is no cogging.

The major drawback to that

other words, by altering the number of magnets as compared to the number of slots where magnets were attracted, we eliminated cogging.

The magnets, as they spun, could find no location that was better than another. Thus, we had a velvety smooth, easy turning generator that was perfect for our needs.

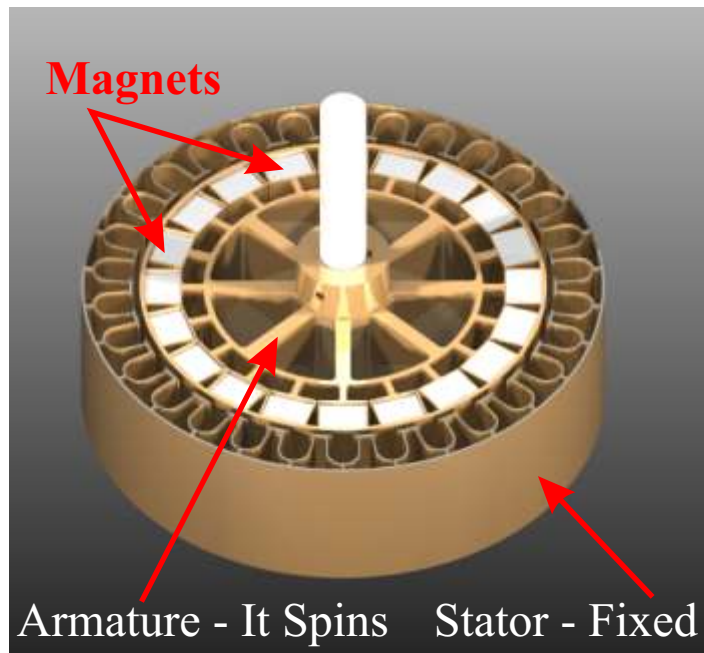
FTC Energy does not, however, accept ideas unless they work in all situations. The concept worked with a 5 KVA generator, but we needed more proof.

Our engineers tried the concept on a larger 50 KVA generator. It also worked. They then tried it on a 150,000 KVA generator with huge magnets. Same results. It worked.

We were at that time developing a line of small 500 watt generators for micro inverters. Naturally, we tried it. It worked. No cogging.

We had created PM generators that were energy efficient and free of cogging.

All versions of our water/steam/compressed air turbines use this generator.



approach is that 30% of the energy in the generator is used just to create the magnetic field.

What we FTC Energy did was simply throw out all the current thinking about PM generators and re-evaluate the whole concept. Our chief scientist came up with a simple yet ingenious idea.

He realized that if we changed the ratio of magnets to places that magnets were attracted we could create an area where one location was no more attractive than another. In

1.5K Class Water Turbine Specifications

Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	225	449	674	898
30	414	829	1,243	1,658
40	656	1,312	1,969	2,625
50	928	1,856	2,785	3,713
60	1,218	2,435	3,653	4,870
75	1,716	3,432	5,148	6,865
100	2,677	5,354	8,030	10,707
125	3,778	7,555	11,333	15,111
150	4,987	9,973	14,960	19,946
200	7,771	15,543	23,314	31,085

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.

Weight - 45 lbs

Dimensions - [Please see next page](#)

Neodymium PM Generator

User Configurable Voltage Ranges

12-72 VDC

24- 144 VDC

48-256 VDC

96- 320 VDC

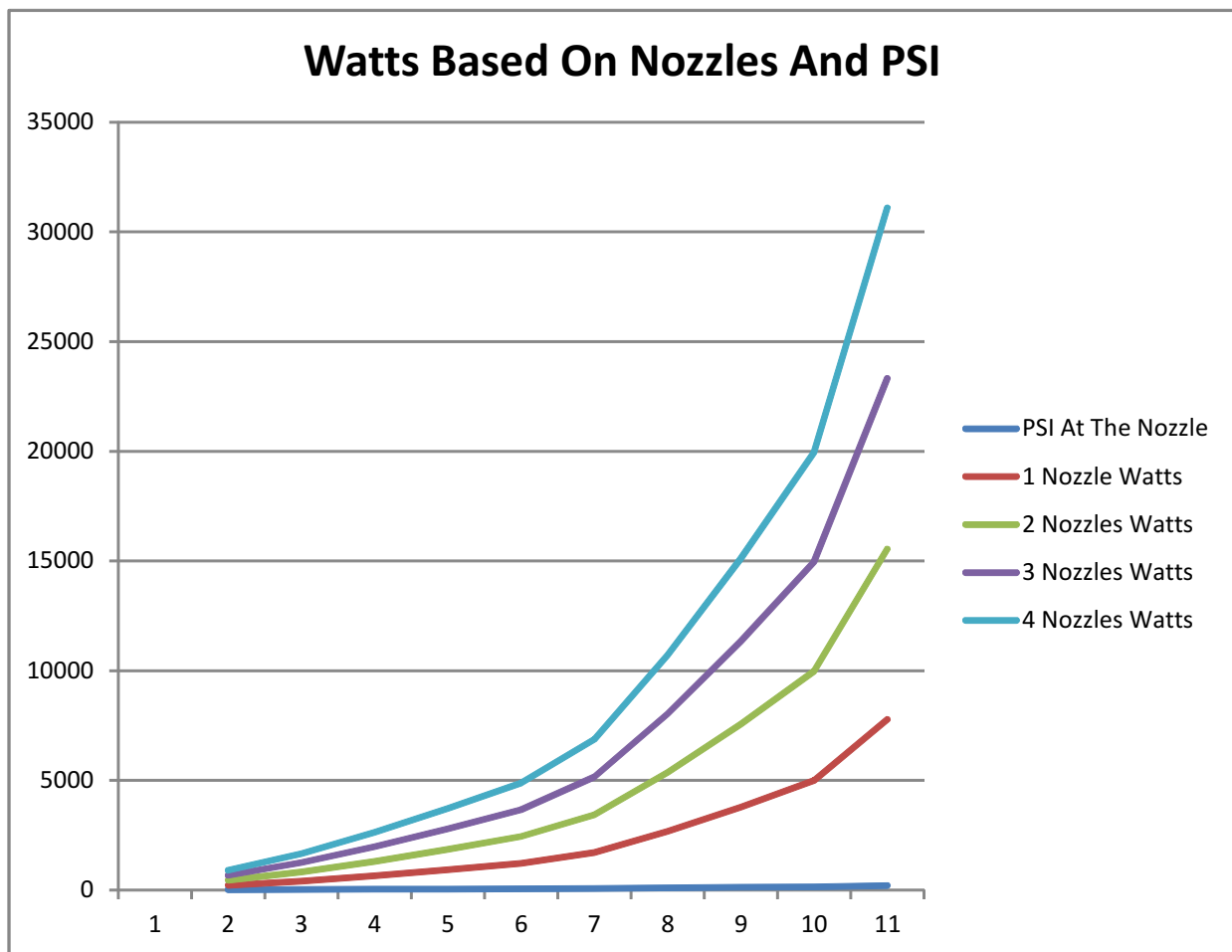
144- 500 VDC

Corrosion resistant bearings and housings.

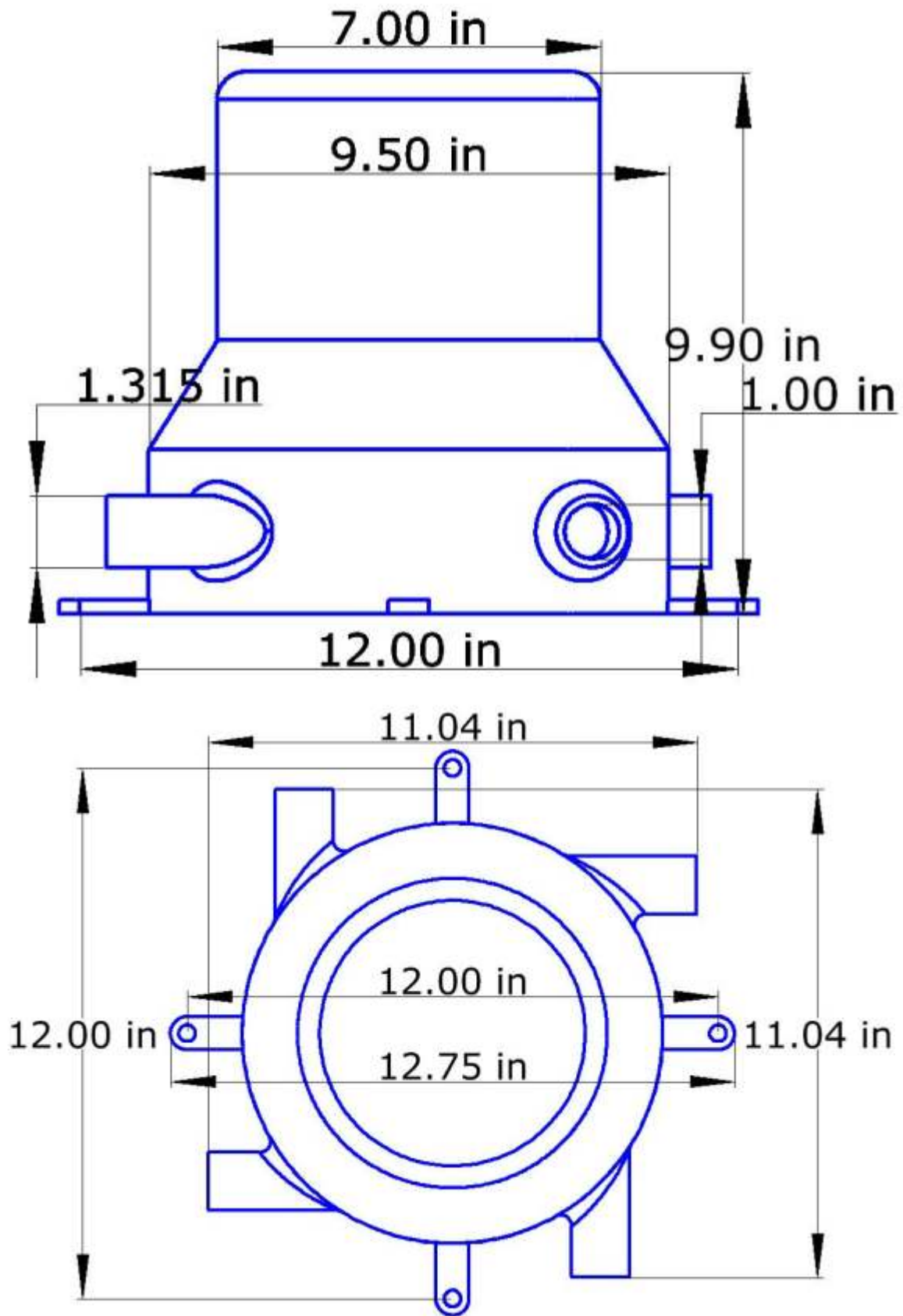
Fittings match 1" Standard PVC Schedule 80.

Warranty - 2 Yrs Parts and Labor.

Unit must be returned to factory for service. Owner pays shipping both ways.



1.5K Class Water Turbine/Generator



2.5K Class Water Turbine Specifications

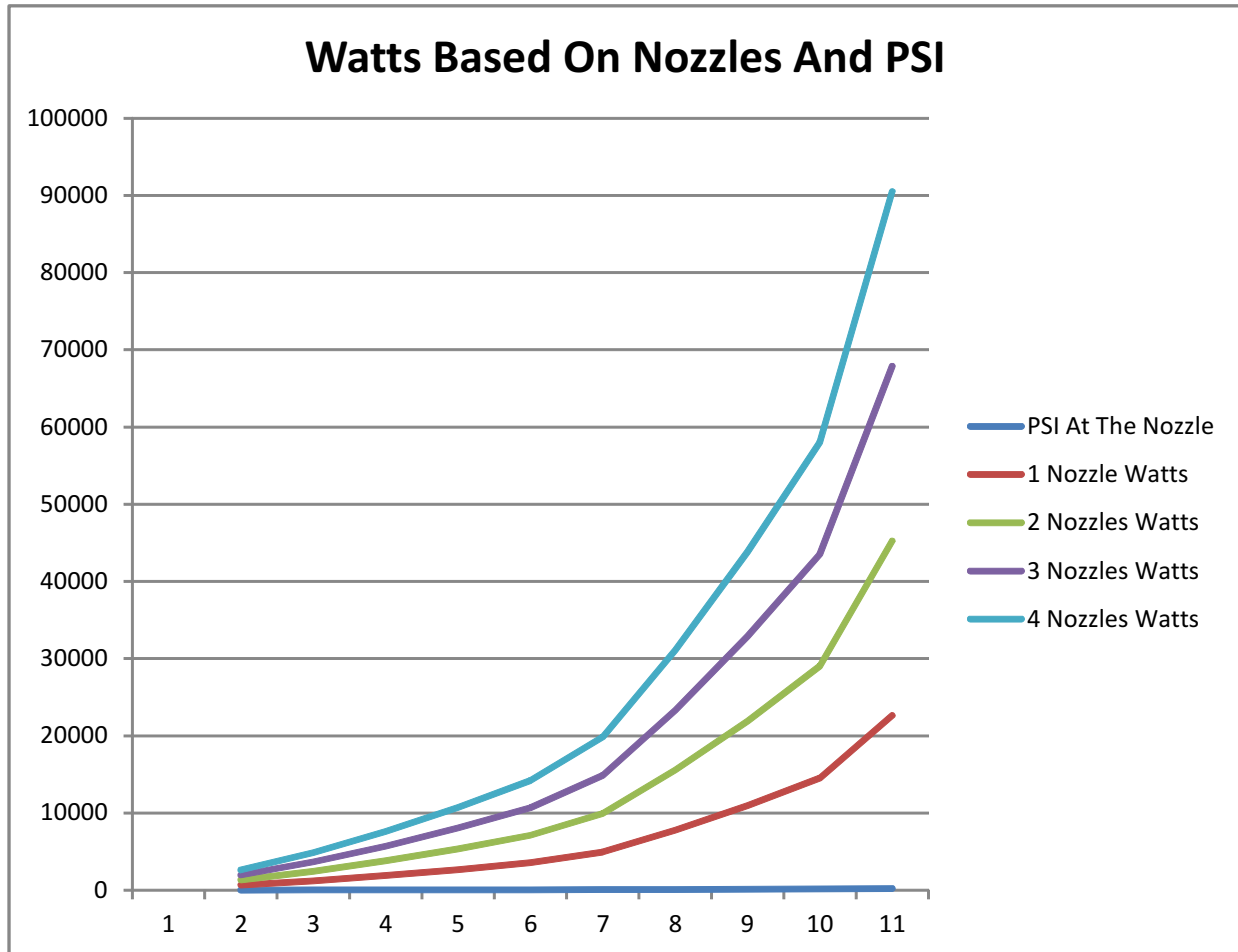
Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	656	1,312	1,969	2,625
30	1,218	2,435	3,653	4,870
40	1,900	3,799	5,699	7,599
50	2,677	5,354	8,030	10,707
60	3,549	7,098	10,647	14,196
75	4,954	9,908	14,863	19,817
100	7,771	15,543	23,314	31,085
125	10,955	21,911	32,866	43,821
150	14,506	29,013	43,519	58,026
200	22,623	45,246	67,869	90,492

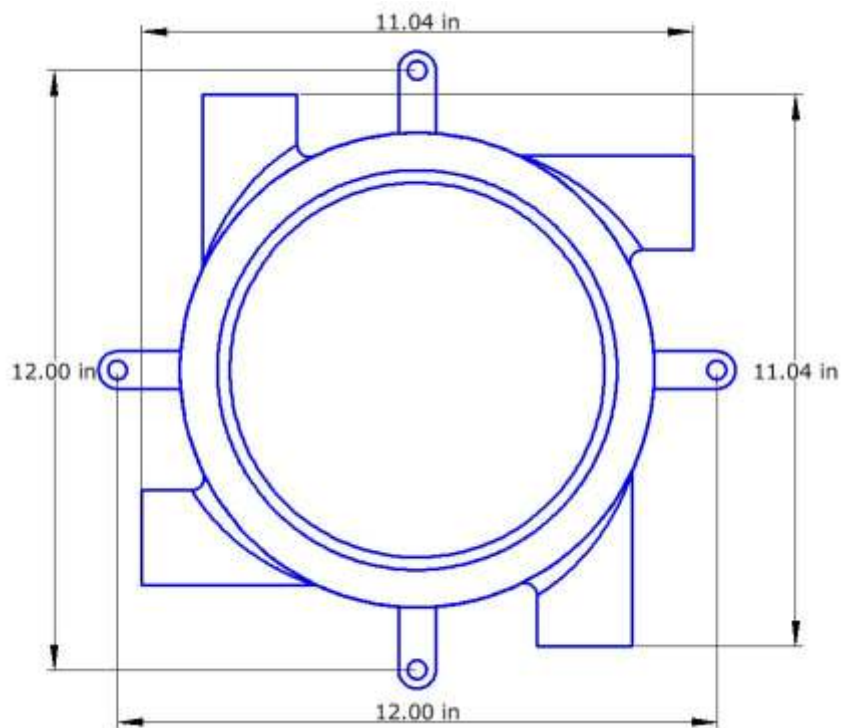
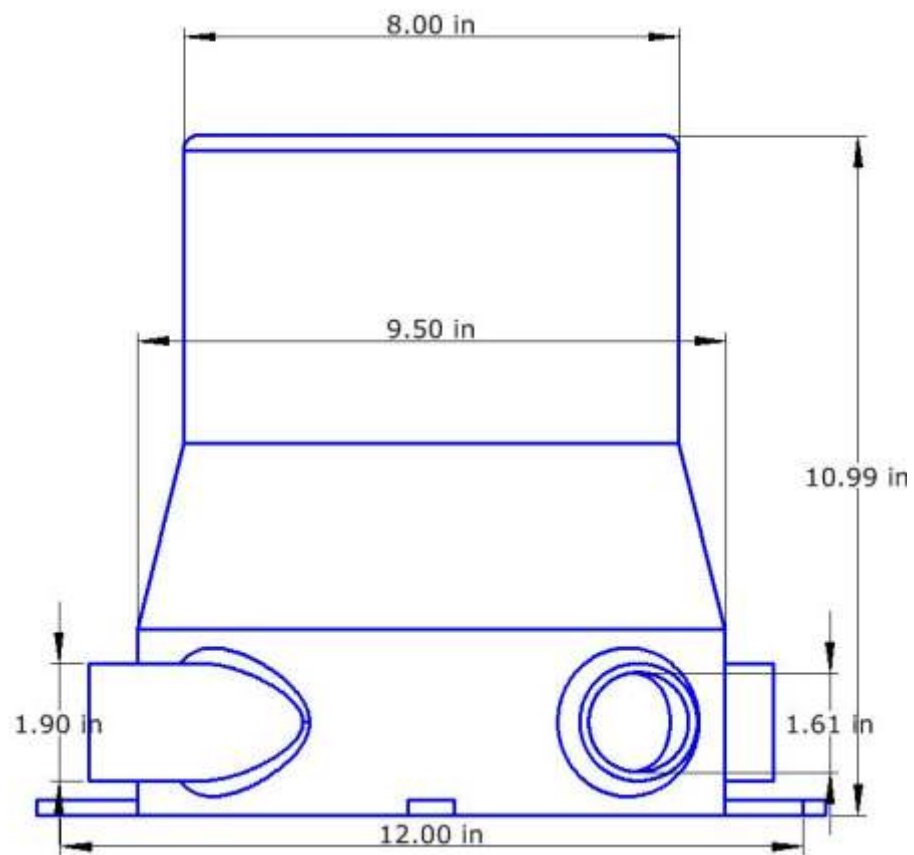
Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.

Weight - 65 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC

Corrosion resistant bearings and housings.
 Fittings match 1.5" Standard PVC Schedule 80.
 Warranty - 2 Yrs Parts and Labor.
 Unit must be returned to factory for service. Owner pays shipping both ways.



2.5K Class Water Turbine/Generator



5K Class Water Turbine Specifications

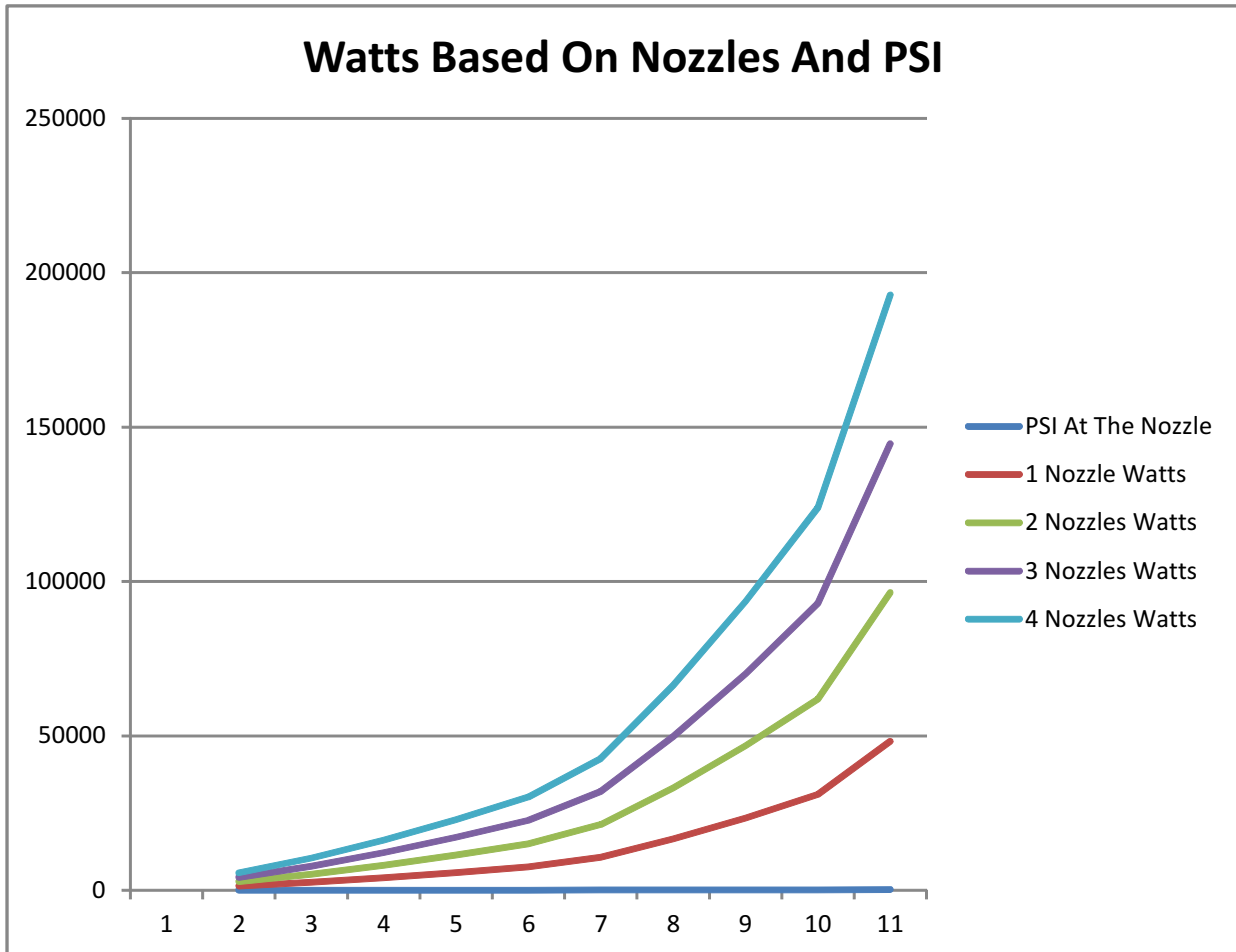
Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	1,390	2,780	4,171	5,561
30	2,590	5,181	7,771	10,362
40	4,041	8,082	12,123	16,164
50	5,699	11,398	17,097	22,796
60	7,538	15,076	22,614	30,153
75	10,653	21,306	31,959	42,613
100	16,579	33,158	49,736	66,315
125	23,368	46,736	70,104	93,471
150	30,956	61,911	92,867	123,823
200	48,182	96,364	144,546	192,728

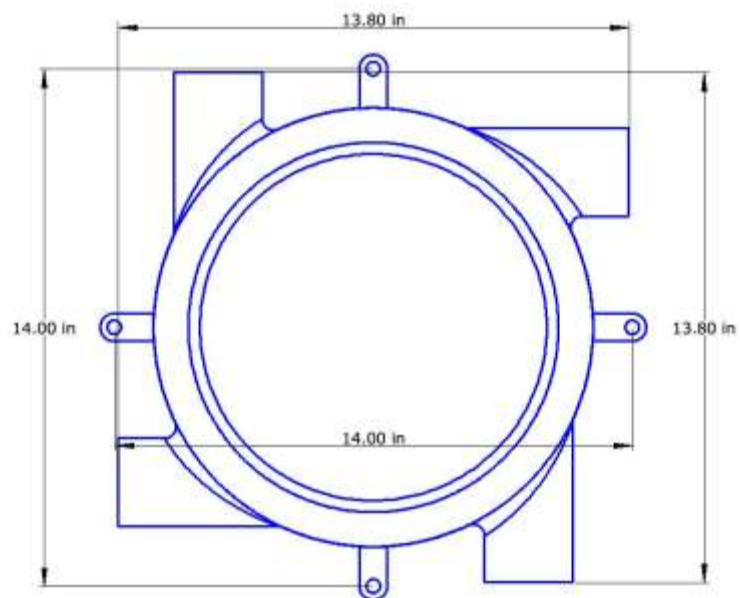
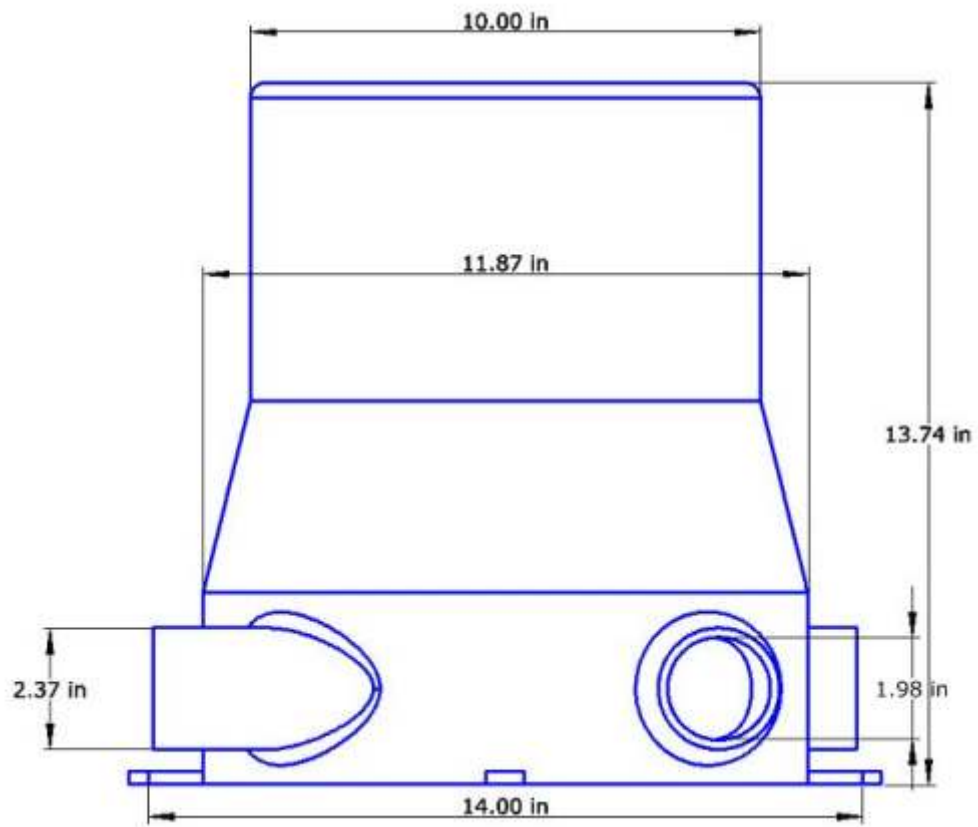
Weight - 93 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC

Corrosion resistant bearings and housings.
 Fittings match 2" Standard PVC Schedule 80.
 Warranty - 2 Yrs Parts and Labor.
 Unit must be returned to factory for service. Owner pays shipping both ways.

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.



5K Class Water Turbine/Generator



25K Class Water Turbine Specifications

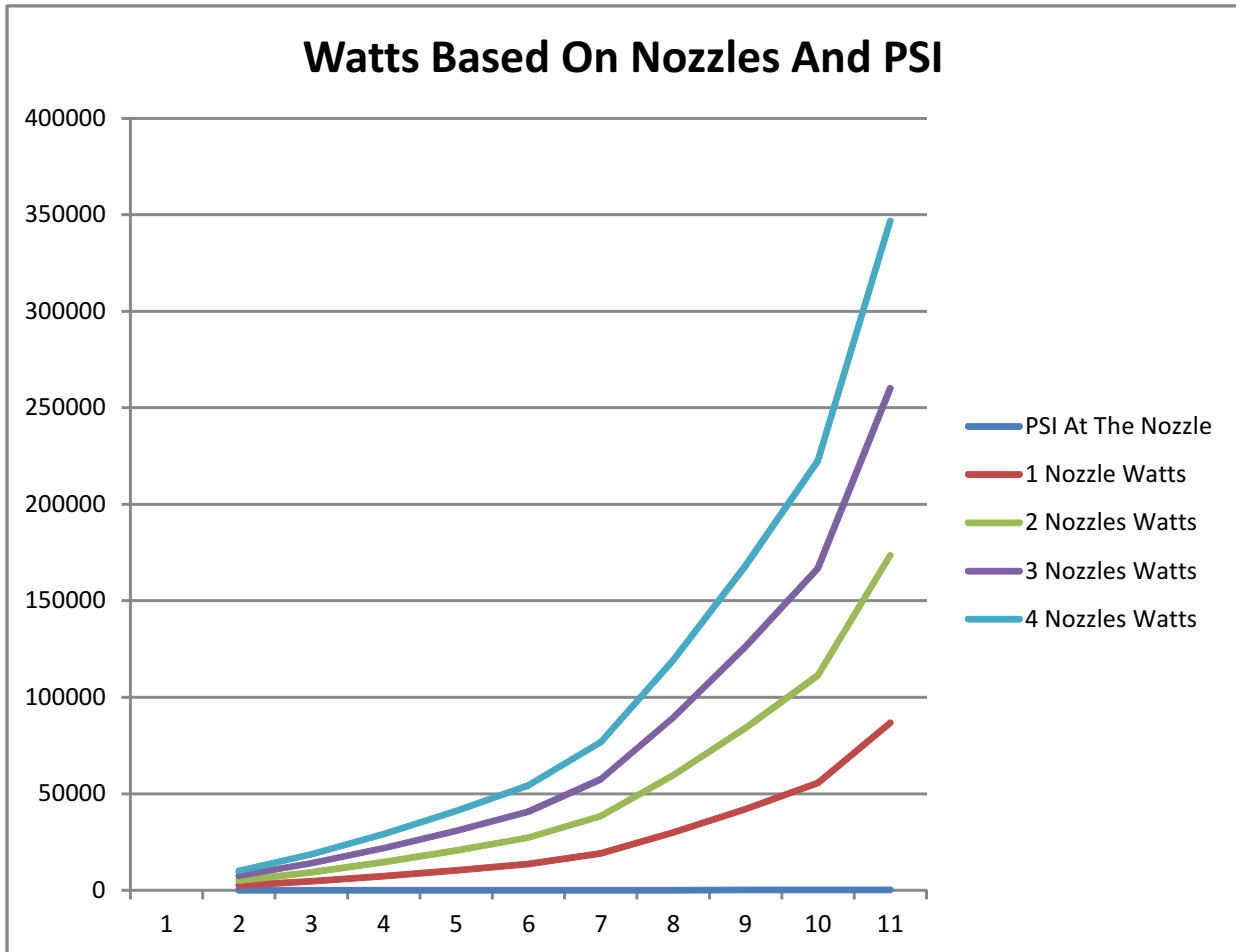
Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	2,504	5,008	7,512	10,016
30	4,663	9,326	13,988	18,651
40	7,270	14,541	21,811	29,082
50	10,254	20,508	30,761	41,015
60	13,574	27,148	40,722	54,295
75	19,137	38,274	57,410	76,547
100	29,790	59,580	89,370	119,160
125	42,041	84,081	126,122	168,162
150	55,630	111,259	166,889	222,518
200	86,693	173,386	260,079	346,772

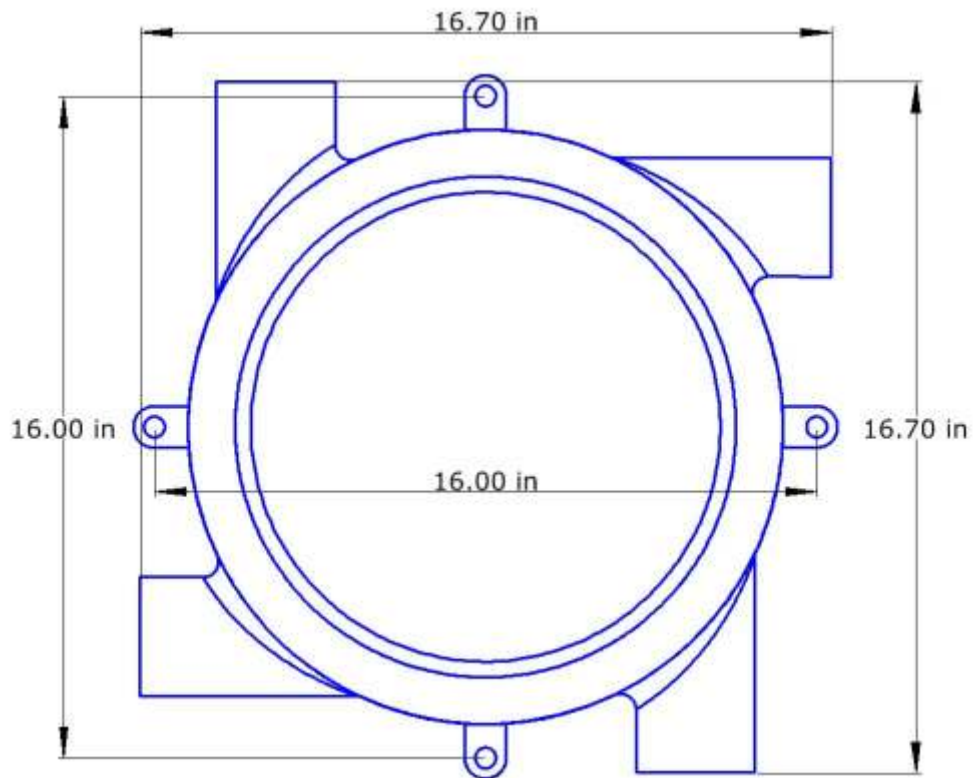
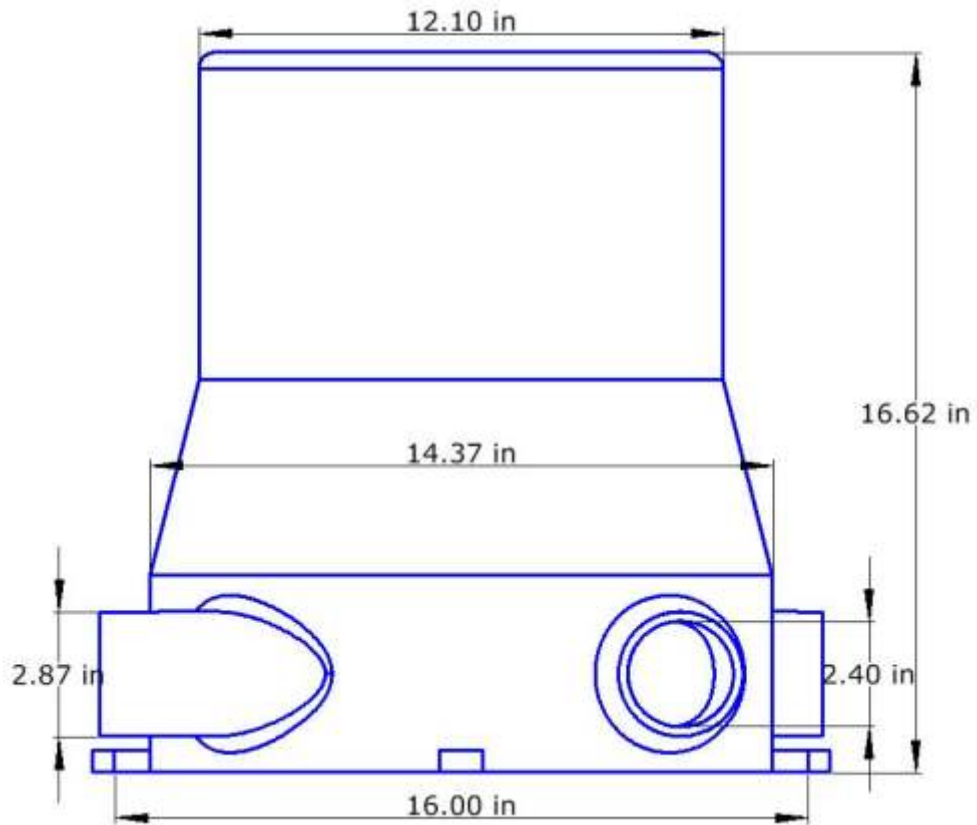
Weight - 163 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC

Corrosion resistant bearings and housings.
 Fittings match 2.5" Standard PVC Schedule 80.
 Warranty - 2 Yrs Parts and Labor.
 Unit must be returned to factory for service. Owner pays shipping both ways.

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.



25K Class Water Turbine/Generator



45K Class Water Turbine Specifications

Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	4,041	8,082	12,123	16,164
30	7,538	15,076	22,614	30,153
40	11,743	23,487	35,230	46,973
50	16,557	33,114	49,672	66,229
60	21,915	43,830	65,745	87,660
75	30,923	61,847	92,770	123,693
100	48,139	96,278	144,417	192,555
125	67,891	135,782	203,673	271,564
150	89,888	179,776	269,664	359,552
200	139,970	279,939	419,909	559,879

Weight - 271 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC

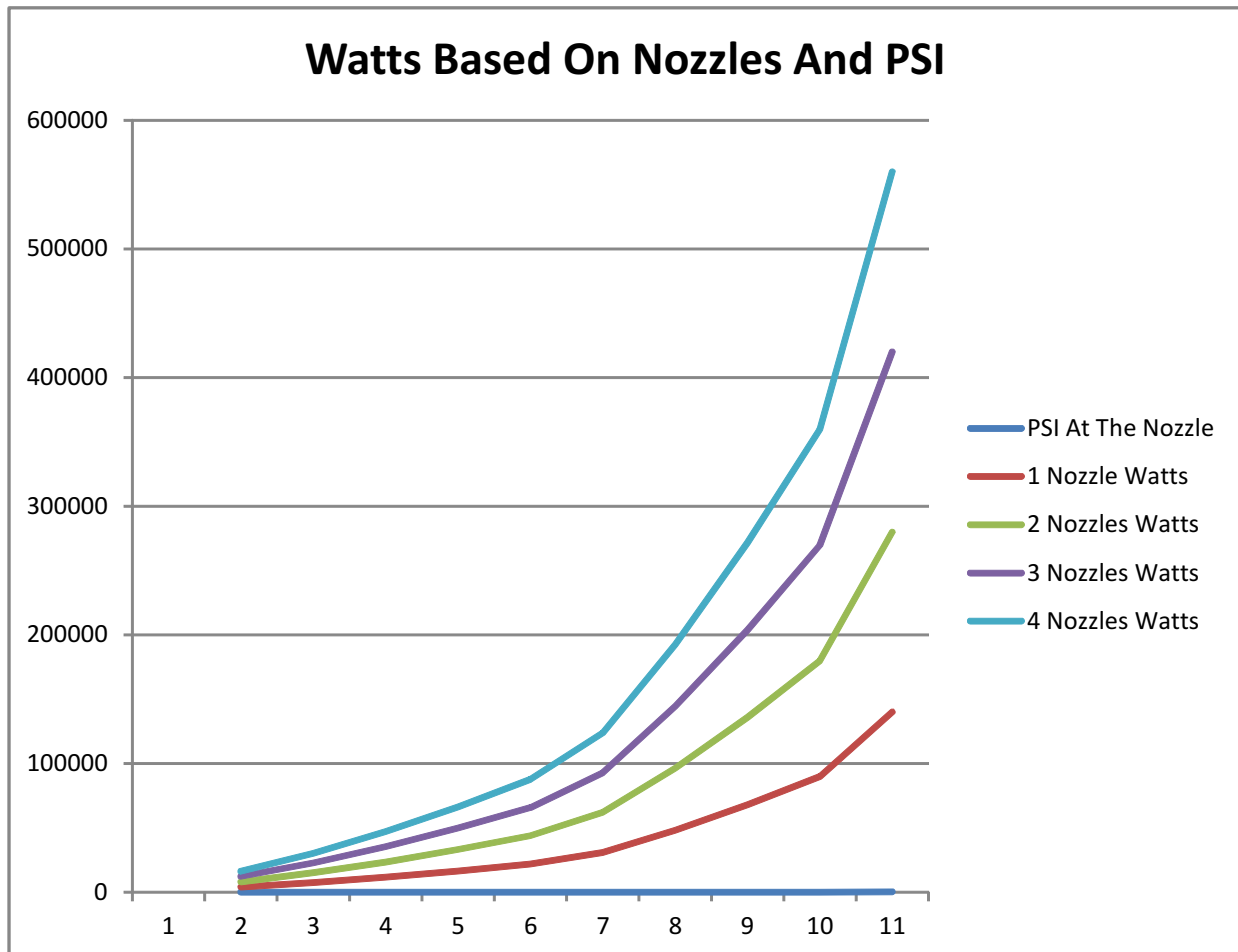
Corrosion resistant bearings and housings.

Fittings match 3" Standard PVC Schedule 80.

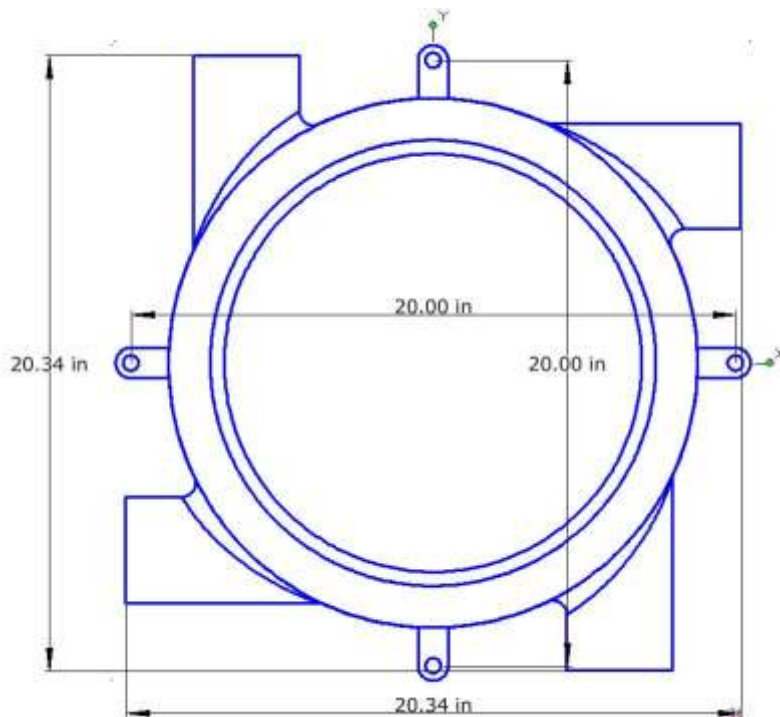
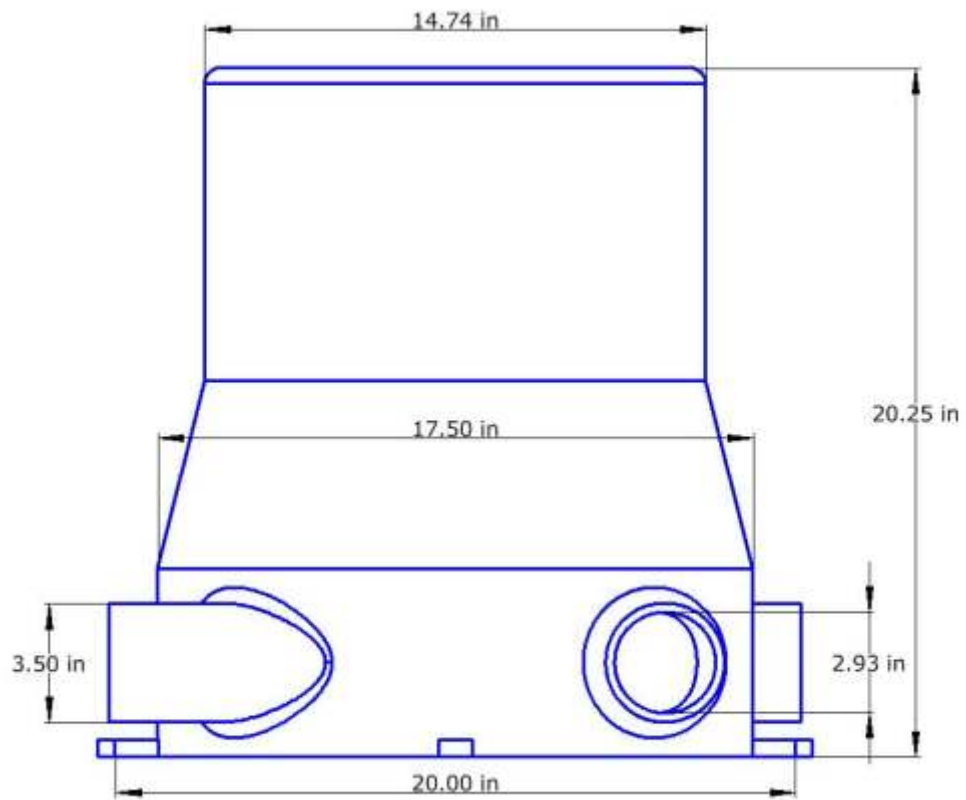
Warranty - 2 Yrs Parts and Labor.

Unit must be returned to factory for service. Owner pays shipping both ways.

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.



45K Class Water Turbine/Generator



93K Class Water Turbine Specifications

Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	8,609	17,218	25,827	34,435
30	16,061	32,121	48,182	64,243
40	25,024	50,047	75,071	100,094
50	35,295	70,589	105,884	141,179
60	46,731	93,463	140,194	186,926
75	65,894	131,788	197,682	263,576
100	102,624	205,249	307,873	410,497
125	144,686	289,373	434,059	578,746
150	191,562	383,125	574,687	766,250
200	298,331	596,663	894,994	1,193,326

Weight - 415 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC
 320 - 1120 VDC

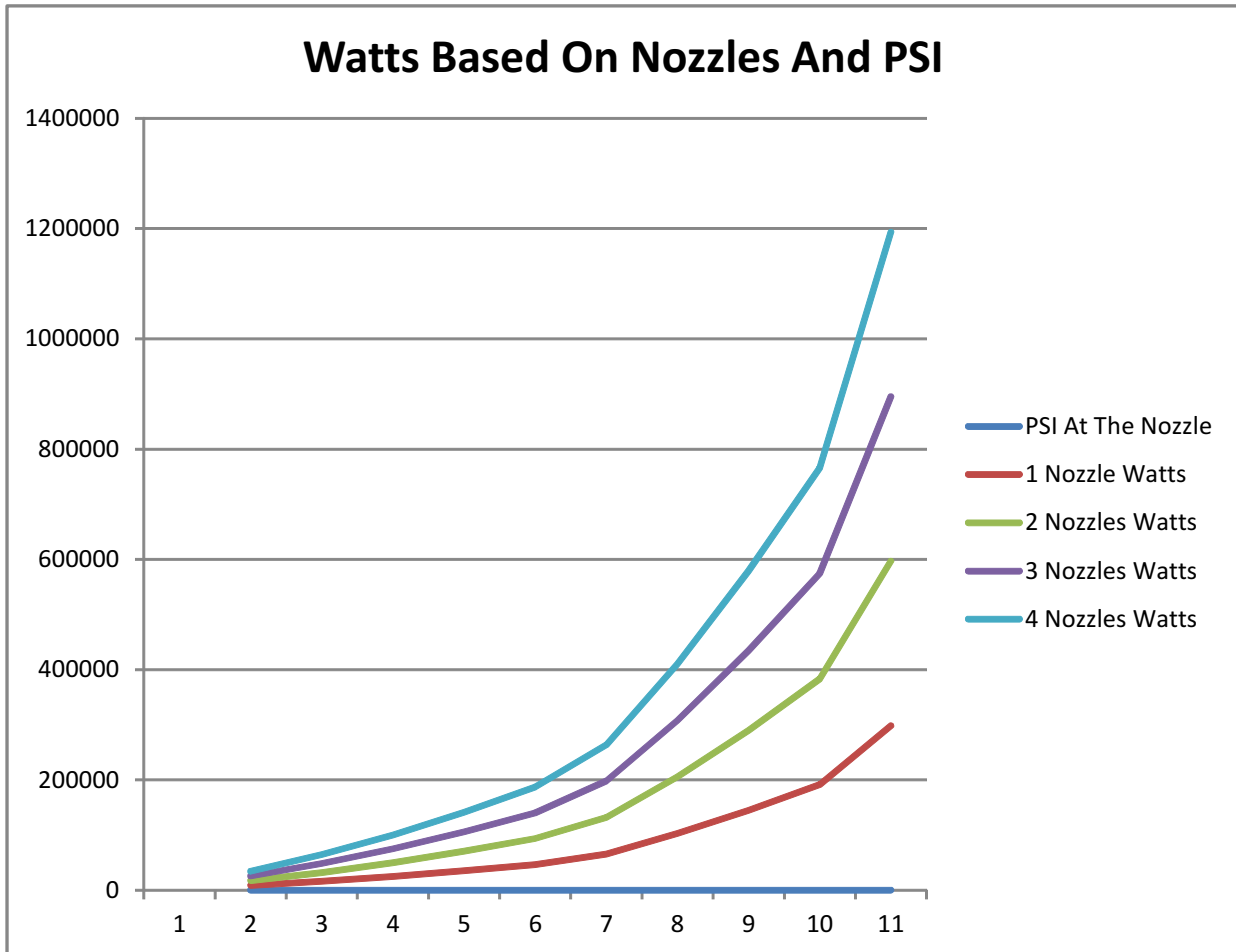
Corrosion resistant bearings and housings.

Fittings match 4" Standard PVC Schedule 80.

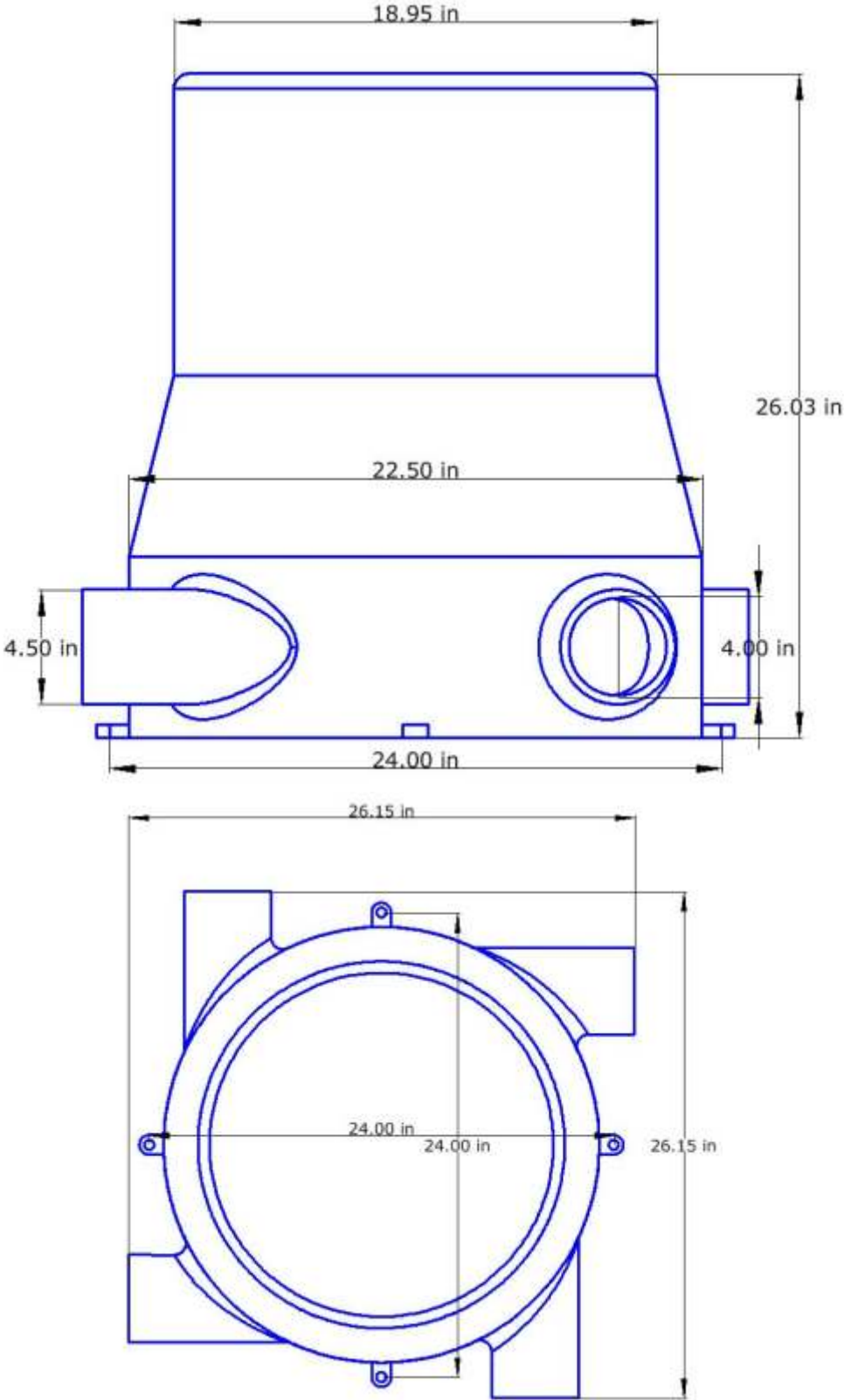
Warranty - 2 Yrs Parts and Labor.

Unit must be returned to factory for service. Owner pays shipping both ways.

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.



93K Class Water Turbine/Generator



270K Class Water Turbine Specifications

Estimated Power

PSI At The Nozzle	1 Nozzle Watts	2 Nozzles Watts	3 Nozzles Watts	4 Nozzles Watts
20	24,998	49,995	74,993	99,991
30	46,667	93,333	140,000	186,667
40	72,688	145,375	218,063	290,750
50	102,495	204,989	307,484	409,979
60	135,713	271,425	407,138	542,851
75	191,368	382,736	574,104	765,473
100	298,072	596,145	894,217	1,192,289
125	420,298	840,595	1,260,893	1,681,190
150	556,489	1,112,979	1,669,468	2,225,958
200	866,758	1,733,517	2,600,275	3,467,034

Weight - 1,003 lbs
 Dimensions - [Please see next page](#)
 Neodymium PM Generator
 User Configurable Voltage Ranges
 12-72 VDC
 24- 144 VDC
 48-256 VDC
 96- 320 VDC
 144- 500 VDC
 320 - 1120 VDC

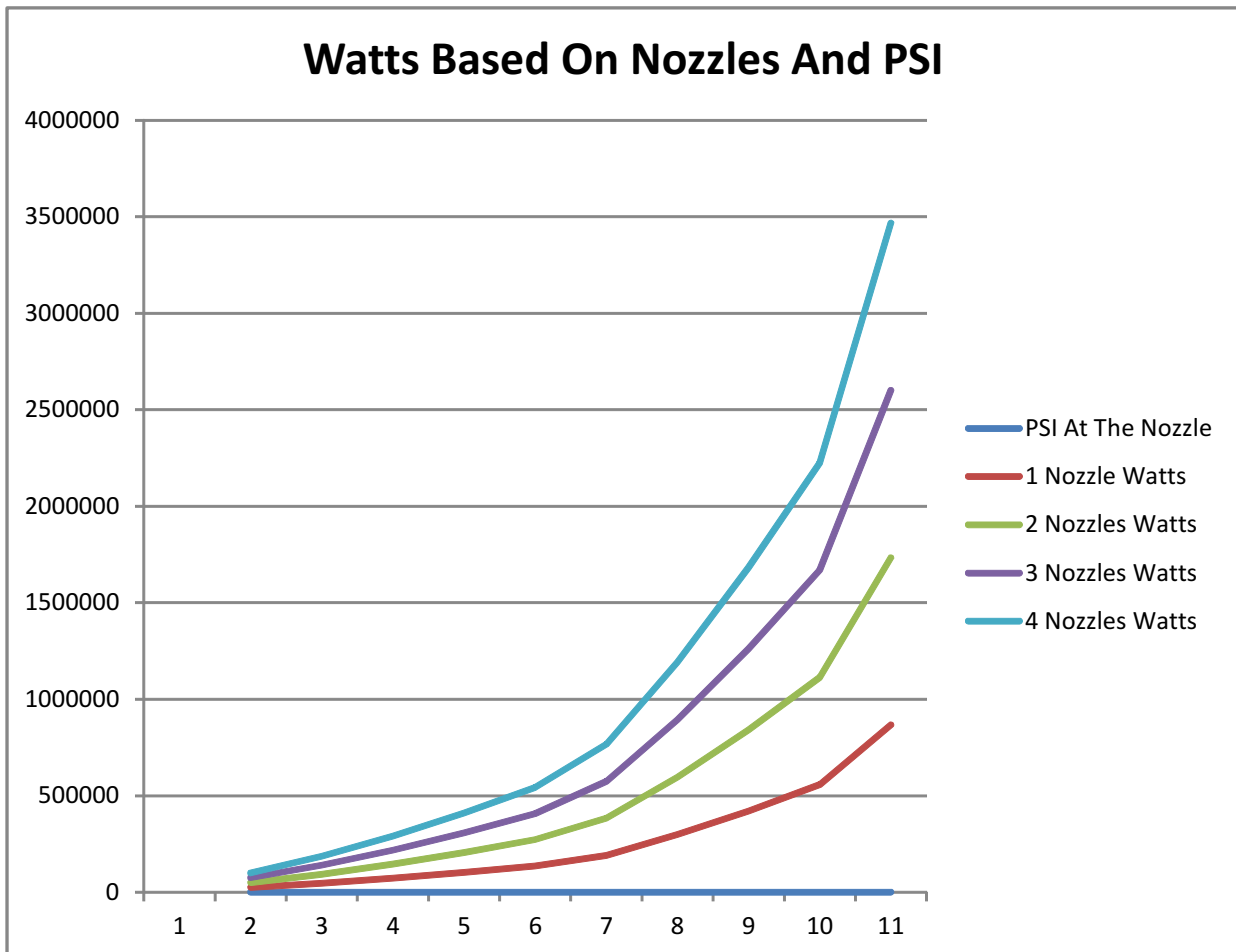
Corrosion resistant bearings and housings.

Fittings match 5" Standard PVC Schedule 80.

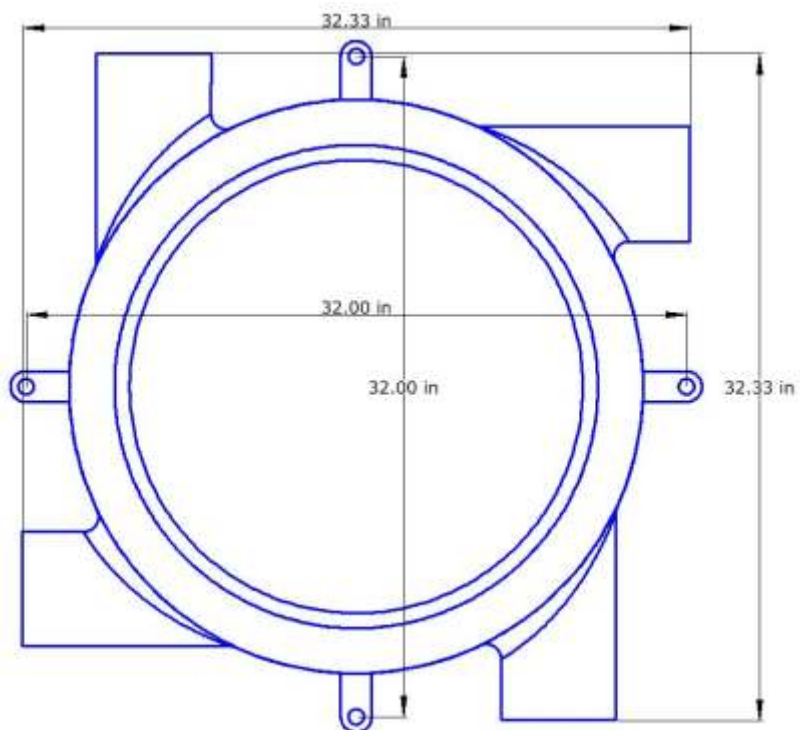
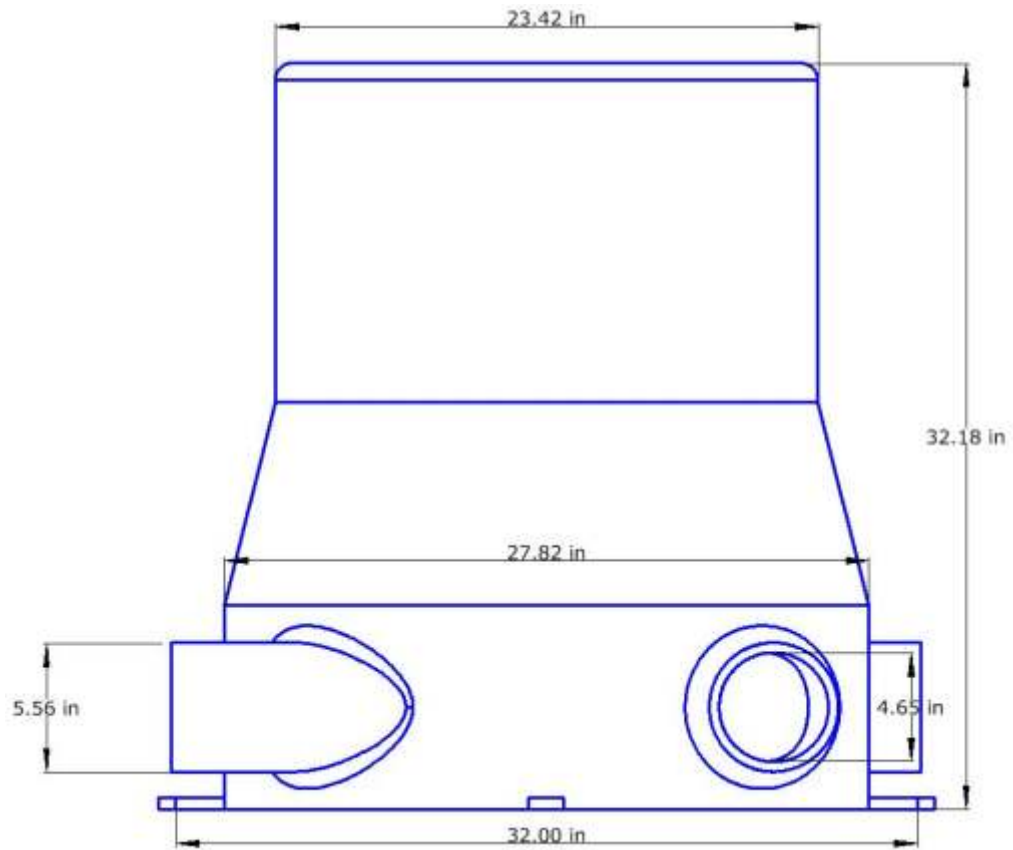
Warranty - 2 Yrs Parts and Labor.

Unit must be returned to factory for service. Owner pays shipping both ways.

Note: Values achieved shown in gray are not recommended and will void the warranty. Please operate within specified ranges.



270K Class Water Turbine/Generator



Buyer assumes responsibility that any FTC Energy product is fit for its actual or intended use and that Buyer placed no reliance on FTC Energy's skill or judgment in selecting suitable products. Installation of the products shall be Buyer's responsibility. Buyer represents and warrants that the use and installation of the goods shall be made in compliance with all applicable government requirements.

All power figures are best estimates based on multiple factors and our own testing. Because field conditions and many other factors that are out of our control, FTC Energy does not and cannot guarantee what, if any, power you will make.

In no event shall FTC Energy be liable for any amounts representing loss of profits, loss of business, loss of business opportunities or for any consequential, incidental, punitive or special damages, nor shall FTC Energy's liability on any claim for damages arising out of or connected with the sales contract or the manufacture, sale, delivery or use of the goods exceed the purchase price of the goods.

Further, all sales are final and there are no refunds because units are built to order.

Promises of delivery from stock are subject to prior sale. Delivery dates are not guaranteed but are estimated on the basis of immediate receipt by FTC Energy of all information to be furnished by Buyer and the absence of delays, direct or indirect, resulting from or contributed to by circumstances beyond FTC Energy's reasonable control. FTC Energy shall in good faith endeavor to meet estimated delivery dates.

All sales are FOB the FTC Energy manufacturing facility. The customer is responsible for all shipping charges, insurance, packaging, and handling. Buyer assumes all risk of loss of goods upon delivery by FTC Energy to the carrier.

FTC Energy warrants to Buyer that the goods at the time of shipment will be free from material defects in material and workmanship and, with respect to FTC Energy's standard catalog items, that the goods will conform in all material respects to FTC Energy's specifications. This warranty shall be ineffective if more than one year has elapsed from the date of manufacture, and it shall not extend to goods subjected to misuse, neglect, accident or improper installation or maintenance or that have been altered or repaired by anyone other than the FTC Energy or its authorized representative. Any model or sample provided to Buyer was used merely to illustrate the general type and quality of goods and not to warrant that goods shipped would be of that type or quality. No agent, employee or representative of FTC Energy has authority to bind FTC Energy to any affirmation, representation or warranty concerning the goods sold hereunder, and any such affirmation, representation or warranty has not formed a part of the basis of the bargain and shall be unenforceable. FTC Energy's sole obligation under the foregoing warranty is limited to, at FTC Energy's option, replacing or repairing defective goods or refunding the purchase price. Buyer's exclusive remedy for breach of warranty will be enforcement of such obligation of FTC Energy. The warranty contained herein is made only to and for the exclusive benefit of Buyer, and does not extend to any subsequent purchaser or user of the goods or of any product of which the goods may be a component part. **THE ABOVE WARRANTY IS THE FTC ENERGY'S SOLE AND ENTIRE WARRANTY OBLIGATION AND LIABILITY. ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE EXPRESSLY EXCLUDED.**