

PSD16 Owner's Manual



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Manual content and data are subject to change without notification.
Manuals available online at: wkfluidhandling.com/owners-manuals

1 Introduction

Thank You for Purchasing White Knight Products

You have purchased a White Knight product that has been designed to our exacting specifications and built by a team of technicians with the highest commitment to quality!

White Knight is the world leader in zero-metal, ultra-high purity pumps and continues to drive the industry with new technology and products. Since the inception of White Knight in 1995, we have been awarded over 14 US design patents and have multiple other patents pending! White Knight currently produces over 30 sizes/models of pumps in varying materials to meet our customers' stringent requirements in numerous applications, including ultra-high temperature re-circulation; high pressure chemical delivery systems, slurry, industrial chemical, and industrial applications.

White Knight has received many prestigious awards for its designs and continues to lead the industry in quality because White Knight controls the manufacturing process from raw materials to finished goods in our facility located in Kamas, UT. This allows us to rigorously manage our quality control process to ensure that our strict cleanliness procedures are always followed and that components are built under consistent methods and conditions for maximum reliability.

Our strict manufacturing process controls include assembling and testing White Knight products in a clean environment. White Knight products also pass a battery of functional tests to ensure operational integrity.

Before installing your White Knight product, please carefully review the product manual. There are many helpful hints and ways to optimize the setup and use of your White Knight product as well as instructions and requirements for installation. In addition, you will also find many accessories in the manual that will enhance the functionality of your White Knight product.

Our team has gone to great lengths to provide you with the highest quality products at the best value and we back them up with excellent warranties and world class support! We hope you agree our products will serve your exacting needs and meet your stringent requirements every time you purchase a White Knight Product.

Sincerely,

White Knight Fluid Handling

2 Specifications & Performance

2.1 Pump Specifications

PSD16 Pump Performance Specification ¹								
Flow Rate	Theoretical Displacement Per Cycle	Suction Lift Wet	Suction Lift Dry	Sound Pressure ³ dB(a)	Sound Power ³ dB(a)	Max. Size of Passible Solids ⁴	Max Operating Temperature	Air Supply Pressure Limits ⁵
142 lpm (37.5 gpm)	.560 L (148 gal)	9.5 L (31.2 ft ²)	4 m (13.1 ft)	66.64 83.28	61.57 78.27	6 mm 0.24 in	100°C TE 70°C UH	30 psi 100 psi

All tests performed with water at ambient temperatures and PTFE check balls

1. Pump Specifications are subject to change based on configuration ordered
2. Suction lift diminishes with wear of pump, minimize suction lift to maximize performance
3. dB Level at 100 psi 50CPM (top) and 100 psi maximum CPM (bottom).
4. The passing of solids may shorten the life of a pump
5. Minimum startup pressure (Max supply pressure)

STORAGE

PSD pumps that are not put into operation upon delivery must be stored in an environment where they are protected from moisture, extreme temperatures, UV radiation, vibration, and should be kept clean. White Knight recommends an environment of ambient temperature (between 60° F (15°C) and 80°F (25°C)) with a humidity level below 65%.

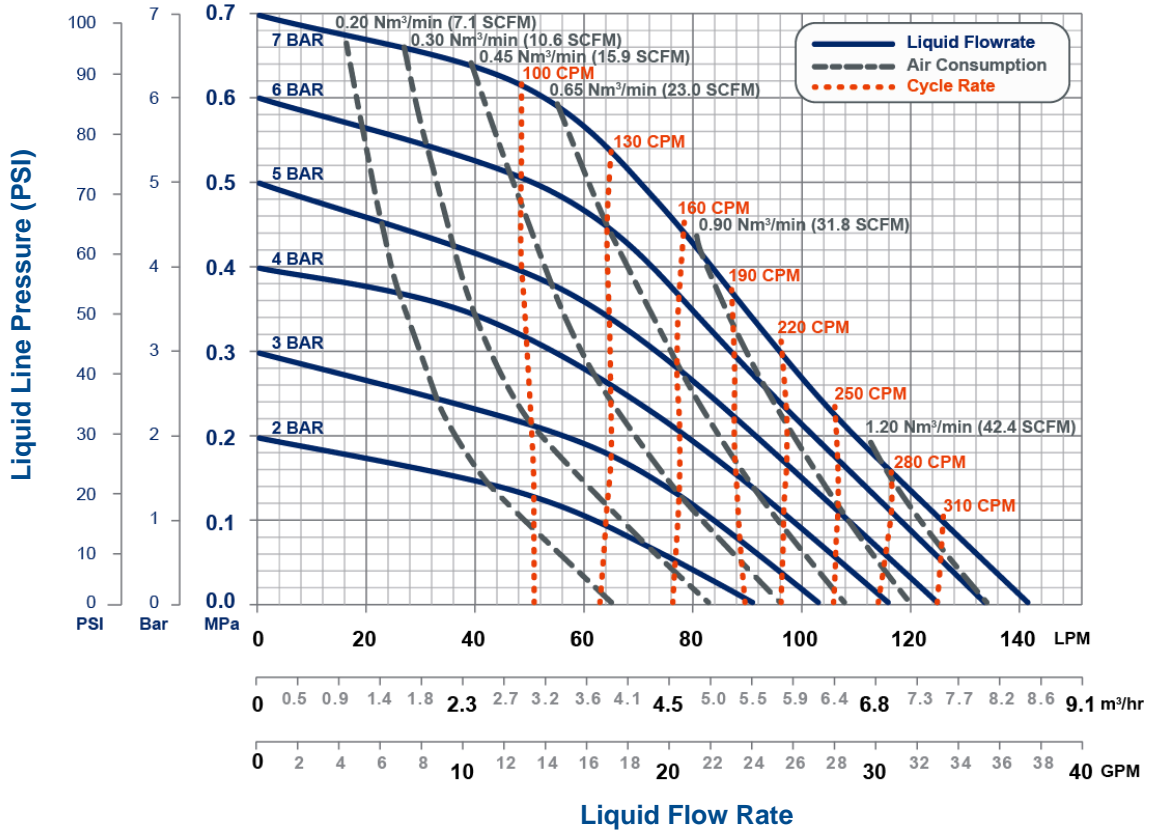
Maintenance and Torque Values

Upon installation of the pump, as well as after a few hours of operating the pump, the head and manifold bolts must be re-torqued. Tie bolts and manifold bolts must be re-torqued to values specified in the table below. Re-torquing will be required after the pump has set for extended periods of time, run in thermal cycling applications, been dismantled, or when there is a large difference between environmental and fluid temperatures. See torquing instructions on page 17.

	Assembly Torque in-lbs. (kg-cm)
Tie Bolts	60 (69.1)
Manifold Bolts	60 (69.1)

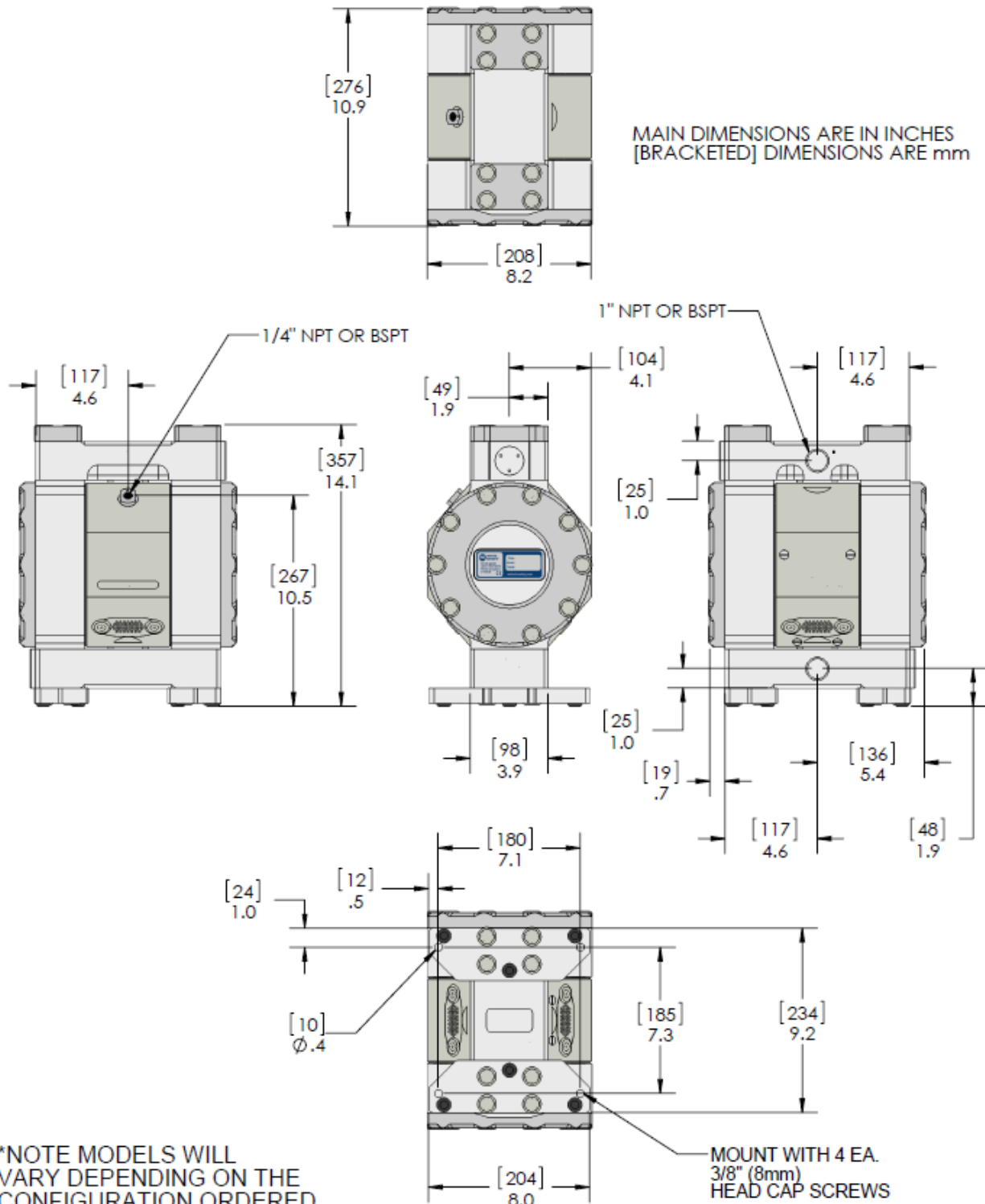
2.2 PSD16 Performance Curves

PSD16 Performance Curve

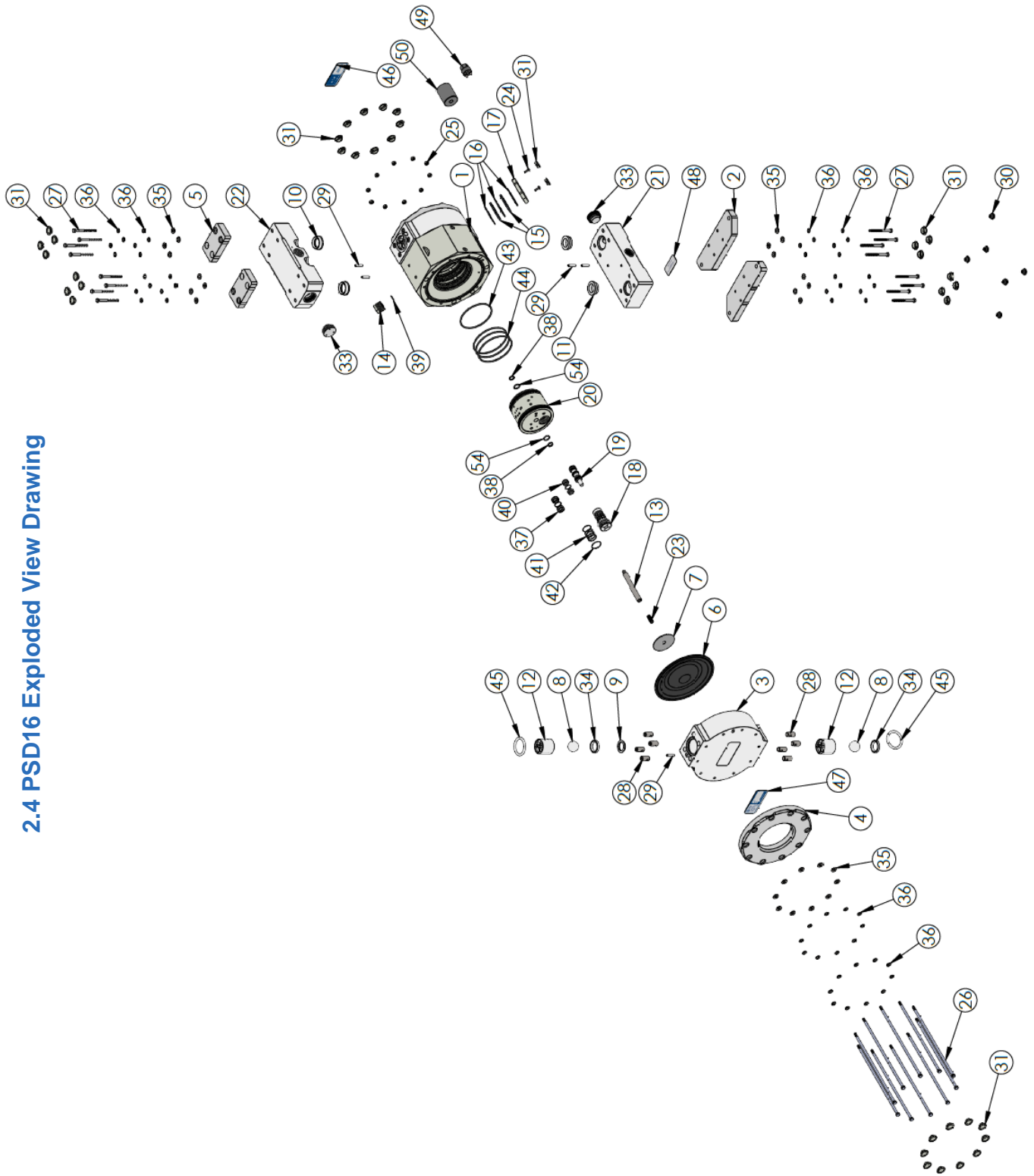


2.3 PSD16 Dimensional Drawing

PSD16



*NOTE MODELS WILL VARY DEPENDING ON THE CONFIGURATION ORDERED.



2.4 PSD16 Exploded View Drawing



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	1125-NP-0002	BODY, PUMP	1	22_N	7500-TE-0004	MANIFOLD OUTLET NPT	1
2	1146-PV-0001	BASE PLATE	2	22_B	7500-TE-0008	MANIFOLD OUTLET BSPT	
3	2127-TE-0050	HEAD	2	22_N	7500-UH-0004	MANIFOLD OUTLET NPT	
3	2127-UH-0002	HEAD		22_B	7500-UH-0008	MANIFOLD OUTLET BSPT	
4	2129-PV-0003	RETAINER, HEAD	2	23	10010-SS-0007	THREADED STUD	2
5	2129-PV-0004	RETAINER, MANIFOLD	2	24	10010-SS-0010	SCREW	4
6_N	3200-BN-0002	DIAPHRAGM	2	25	10010-SS-0013	NUT	10
6_O	3200-EM-0002	DIAPHRAGM		26	10010-SS-0107	TIE HEX BOLT	10
6_E	3200-TE-0002	DIAPHRAGM		27	10010-SS-0017	SCREW	16
7	3300-SS-0003	STRIKE PLATE	2	28	10011-SS-0002	MANIFOLD NUT	16
8_T	4100-TE-0004	CHECK BALL- 1-1/8"	4	29	10020-WC-0001	DOWEL PIN	6
8_E	4100-EM-0002	CHECK BALL- 1-1/8"		30	10040-NB-0001	FOOT RUBBER	6
8_S	4100-SS-0002	CHECK BALL- 1-1/8"		31	10040-PE-0009	CAP PLUG	40
8_N	4100-NB-0002	CHECK BALL- 1-1/8"		32	10040-TE-0003	NPT PLUG	4
9	4135-TE-0012	WEARABLE SEAT	2	33	10040-TE-0013	PLUG	2
9	4135-UH-0004	WEARABLE SEAT		34	10050-MP-0001	D-RING	4
10	4135-TE-0015	TOP MANIFOLD WEAR SEAT	2	34	10050-UH-0006	D-RING	
10	4135-UH-0007	TOP MANIFOLD WEAR SEAT		35	10050-SS-0002	WASHER NO 12	36
11	4135-TE-0016	BOTTOM MANIFOLD WEAR SEAT	2	36	10050-SS-0005	WASHER, BELLEVILLE	72
11	4135-UH-0008	BOTTOM MANIFOLD WEAR SEAT		37	10050-UH-0003	GLIDE SEAL	10
12	4137-TE-0005	CHECK CAGE	4	38	10050-UH-0004	GLIDE SEAL	2
12	4137-UH-0003	CHECK CAGE		39	10080-EM-014-70	-014 O-RING	1
13	5144-SS-0002	SHAFT	1	40	10080-EM-015-70	-015 O-RING	10
14_N	6060-NP-0007	INLET ADAPTER, 1/4" NPT	1	41	10080-EM-020-70	-020 O-RING	10
14_B	6060-NP-0008	INLET ADAPTER, 1/4" BSPT		42	10080-EM-022-70	-022 O-RING	2
15	6140-FP-0006	BAFFLE	4	43	10080-EM-113-50	-113 O-RING	2
16	6140-PP-0001	SPACER BAFFLE	6	44	10080-EM-238-70	-238 O-RING	1
17	6150-NP-0009	MUFFLER CAP	2	45	10080-EM-240-70	-240 O-RING	3
18	6550-PT-0002	SLEEVE	2	46	10080-TE-326	-326 O-RING	4
19	6560-PT-0001	SPOOL	2	47	19100-PP-0038	PRODUCT LABEL	1
20	6600-NP-0002	AIR MOTOR	1	48	19100-PP-0058	CE LABEL	1
21_N	7500-TE-0003	MANIFOLD INLET NPT	1	49	19100-PP-0124	PATENT STICKER	1
21_B	7500-TE-0007	MANIFOLD INLET BSPT		50	12100-PV-0030	SLEEVE WRENCH	1
21_N	7500-UH-0003	MANIFOLD INLET NPT		51	12100-PV-0032	WEAR SEAT INSTALLATION TOOL	1
21_B	7500-UH-0007	MANIFOLD INLET BSPT					

3 Installation

3.1 Installation Precautions

Required Air Flow and Operating Pressure
Required Air Flow for the PSD16 is 3/8" minimum orifice unrestricted. An adaptor is included for 1/4"NPT or 1/4" BSPT with all pumps, NPT or BSPT is decided on based on the liquid fittings requested. Max air supply for the PSD16 is 7 Bar (100 PSI).
Restriction of Liquid Inlet Line
Restricting the liquid supply of the pump forces the pump to work harder than normal and should be avoided whenever possible, especially when pumping viscous liquids. Attempting to operate the pump against a closed liquid inlet will cause serious damage to the pump, and will void the warranty. If you wish to slow or stop your pump this may be done by closing off the liquid outlet.
Supply Pressure Recommendations
The life of your pump may be extended significantly by operating your pump 30%-40% below redline operating supply pressures. The use of undersized regulators, valves, and supply lines can decrease pump performance and longevity significantly.
Orientation
White Knight does not recommend installing your pump in any position other than its upright position. Check valves within White Knight PSD pumps are actuated by gravity and/or flow and perform optimally in the upright position.
Failure Potential
It is possible that the diaphragm may fail. In such a situation it is possible that chemical could enter the air side of the pump, and may even escape through the muffler. In such a situation the muffler media must be replaced and the air side purged. White Knight recommends that the implementation of a one way valve on the air side to protect air lines from contamination in the event of a diaphragm failure.
Muffler
Pump performance may be restricted in the event of a clogged muffler. Regular inspection of air lines and muffler media is recommended to maintain performance.
Product Testing
Each pump is tested before being packaged for shipment. White Knight recommends the flushing of each pump before servicing if water can contaminate the process.

3.2 PSD Installation Advantages

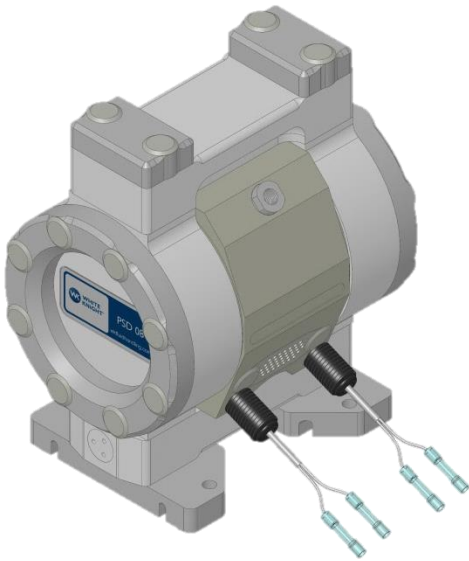
Head Pressure / Dead-Head
White Knight PSD pumps may be controlled by opening and closing the outlet of the pump and may be installed in any head pressure situation up to dead-head. Dead-head occurs when air supply pressure and the liquid line (head) pressure are equal. Dead-head conditions allow for no flow. Under dead-head conditions the PSD will cease to cycle (limiting wear) until conditions change allowing for flow.
Passing Solids
All damage caused by passing solids (wafer shards, etc.) is coverable under warranty when your pump is used in conjunction with a White Knight Catcher™ pre-pump filter.
Running Dry
White Knight PSD pumps are capable of running dry without damage other than normal wear to the pump. When a pump is run dry it cycles faster than normal, accelerating the rate of normal wear.

3.3 System and Pump Environment

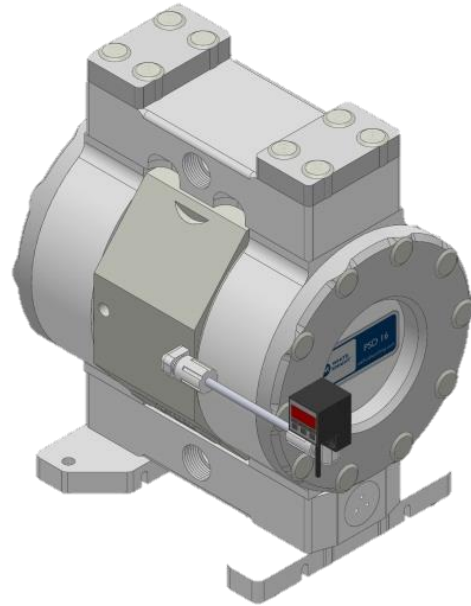
Clean Dry Supply Air (CDA)
Operation of the point of 5 PSD16 requires class 4 quality air for particles, moisture, and oils. (maximum particle size 15 microns, 3° C Dew 5 mg/m³) per ISO8573 – 1.
Flammable Solvents
Any system used to pump flammable solvents should be properly grounded. A test from River’s Edge on using isolative pumps to pump flammable liquids indicated that the liquid itself must be grounded and that other procedures should be followed. A copy of the test is available upon request from White Knight.
Abrasive Slurries
For slurry applications White Knight recommends use of the PSD UH pump.
Pumping Liquids Near Boiling Point
The boiling point of a liquid is reduced under vacuum (suction) conditions. Due to the vacuum caused by a pump, liquid could boil in the inlet line of the pump when it is not boiling in the tank (or other supply reservoir). Placing the pump as close as possible to the tank and with as little vertical lift as possible (the pump being flooded by gravity is ideal) minimizes boiling in the inlet line. Boiling of the liquid in the inlet line causes a pump to “race” and accelerates the wear of the pump. Boiling liquids may cause cavitation to occur. Damage to wearable or non-wearable components of the pump caused by cavitation is not covered under warranty.
Running a Submerged Pump
When running the PSD in submerged mode, the exhaust air must be sealed and redirected above the surface of the media. Take care that all pump parts (air side and wet side) are resistant to the media being used. It may be necessary to mount the pump to the bottom of the tank. Operating this pump while submerged requires use of a remote muffler adaptor kit.
Temperature
The PSD may be operated safely in low temperature applications. Take care to avoid freezing or crystallization of the fluid inside or outside of the pump. Running the pump at temperatures below freezing may accelerate the wear of the elastomer components within the pump. In applications where the media or pump temperature varies, torque values (tension) of the manifold and head bolts must be monitored. TE versions of the PSD Series pumps can be operated at temperatures up to 100°C (212° F). UH versions of the PSD Series pumps can be operated at temperatures up to 70°C (158°F).

3.4 Control and Monitoring Connections

- **PUMP MONITORING:** Pump monitoring can be performed by solid state pressure switch monitoring. This option is described on our website in the accessories section and is available for new orders and for retrofits in the field.



Conductivity Leak Detection



Pressure Switch Stroke Detection

- Pump Control: Run mode and flow rate are two of the items which the CPT-1 can control/monitor.



3.5 PSD 16 Installation Instructions

1.



2.



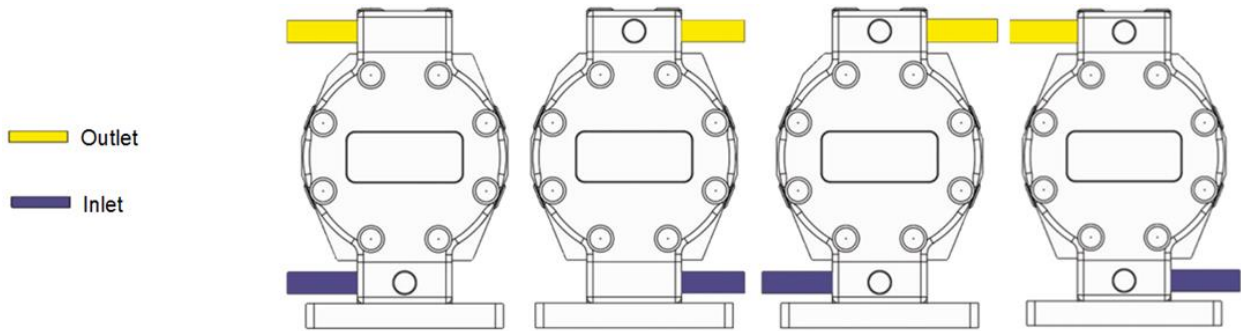
3.



Use appropriate air fitting adapter for 1/4" NPT or 1/4" BSPT

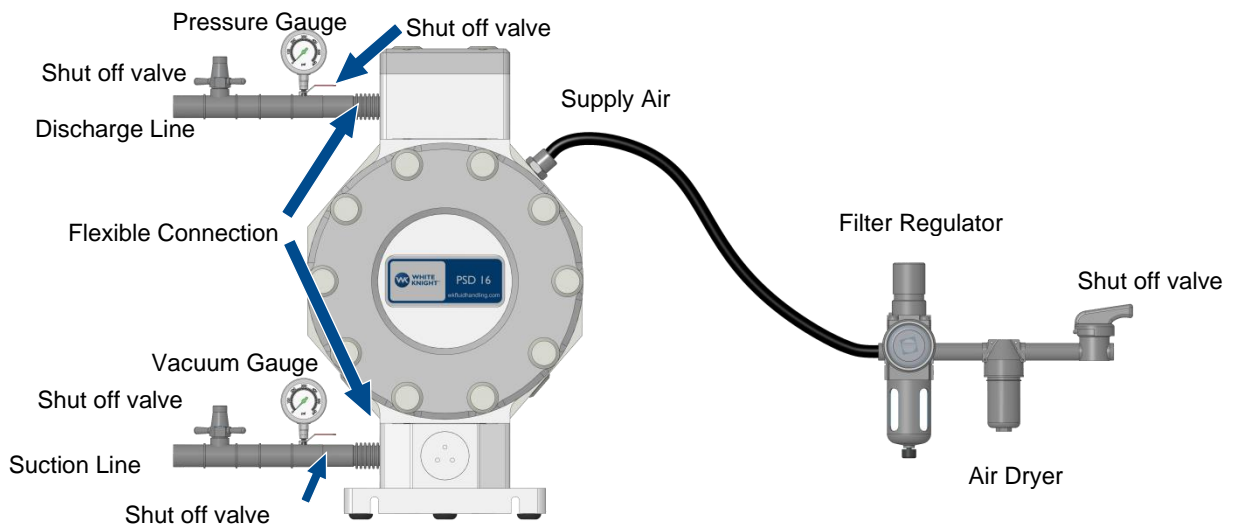
- Fix base plate to work station with four 3/8" or 10 mm bolts. (Bolts not included.)
- Attach 1" liquid fittings to pump. Excessive force may damage threads.
- Ensure airline is free of solids before attaching. Supply air via 1/4" NPT air fitting with flexible connection.

Inlet/Outlet Configurations



Some configurations require re-orientation of crossover manifolds. See Disassembly and Assembly Instructions.

Recommended Set Up



Caution: closing suction line while pump is operating will cause irreversible damage to the pump.

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