

PHC40-2 Owner's Manual

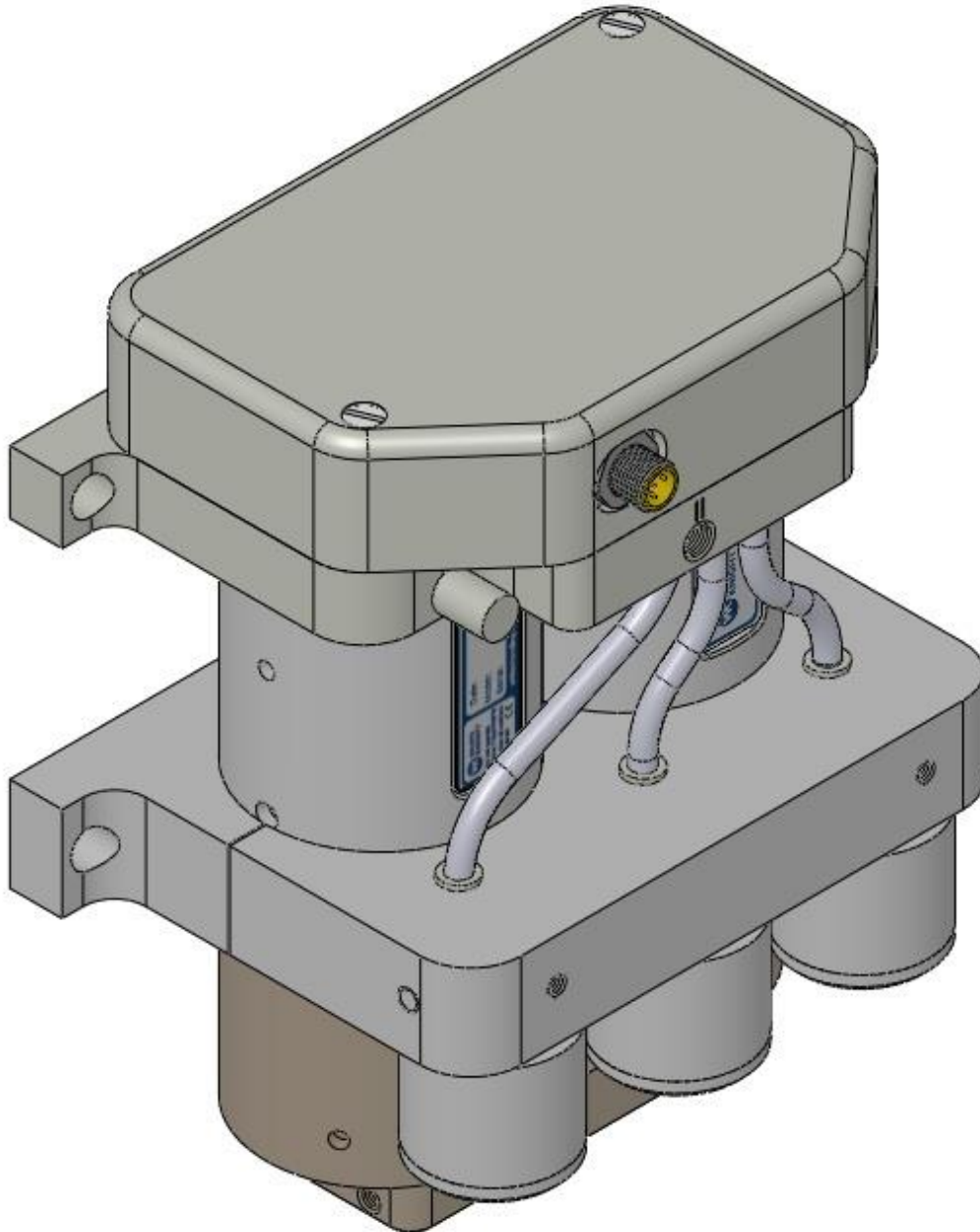


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1 Introduction

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 patents for our designs 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; slurry and high pressure chemical delivery systems.

White Knight has been the recipient of multiple prestigious industry awards for its designs and continues to lead the industry in quality because White Knight manufactures products from raw material to finished goods in our own facility located in Kamas, UT. This allows us to rigorously manage our quality assurance process to ensure that our strict cleanliness procedures are always followed and that components are built using consistent methods and conditions to make our products reliable and consistent.

Our strict process controls include assembling and testing our products in a class 100, temperature and humidity-controlled cleanroom. White Knight products also pass functional tests and are then dried with CDA and double bagged in the cleanroom to ensure cleanliness and operational integrity.

Before installing your White Knight product, please carefully review the product manual. There are many helpful hints and ways to optimize the set up and use of your White Knight product as well as instructions and requirements for installation. In addition, there are many accessories in this 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 use a White Knight Product.

Sincerely,

Steve Smith
CEO
White Knight Fluid Handling

2 Pump Warranty

White Knight Fluid Handling follows strict procedures in all phases of manufacturing, assembly, and testing to ensure reliability of its products. Each pump is individually tested to assure its functional operation integrity.

White Knight Fluid Handling warrants the PHC40 dispense pump, subassemblies and components to be free from defects in materials and workmanship to one year from date of start-up or 18 months from the date of shipment, whichever occurs first. Failures due to misuse, abuse or any unauthorized disassembly of a White Knight® pump will nullify this warranty.

The PHC40 metering pump is warranted for up to 7 BAR air supply pressures, and 40 BAR discharge pressures. Wearable parts are not covered if used to pump abrasive slurries.

Due to the broad and ever-evolving applications for usage of White Knight® pumps we cannot guarantee the suitability of any pump component or subassembly for any particular or specific application. White Knight Fluid Handling shall not be liable for any consequential damage or expense arising from the use or misuse of its products in any application. Responsibility is limited solely to the replacement or repair of defective White Knight® pumps, components or subassemblies. All options to rebuild or replace aforementioned items shall remain under the judgment of White Knight Fluid Handling. Decisions as to the cause of failure shall be solely determined by White Knight Fluid Handling.

Prior written, faxed or emailed approval must be obtained from White Knight Fluid Handling before returning any pump component or subassembly for warranty consideration.

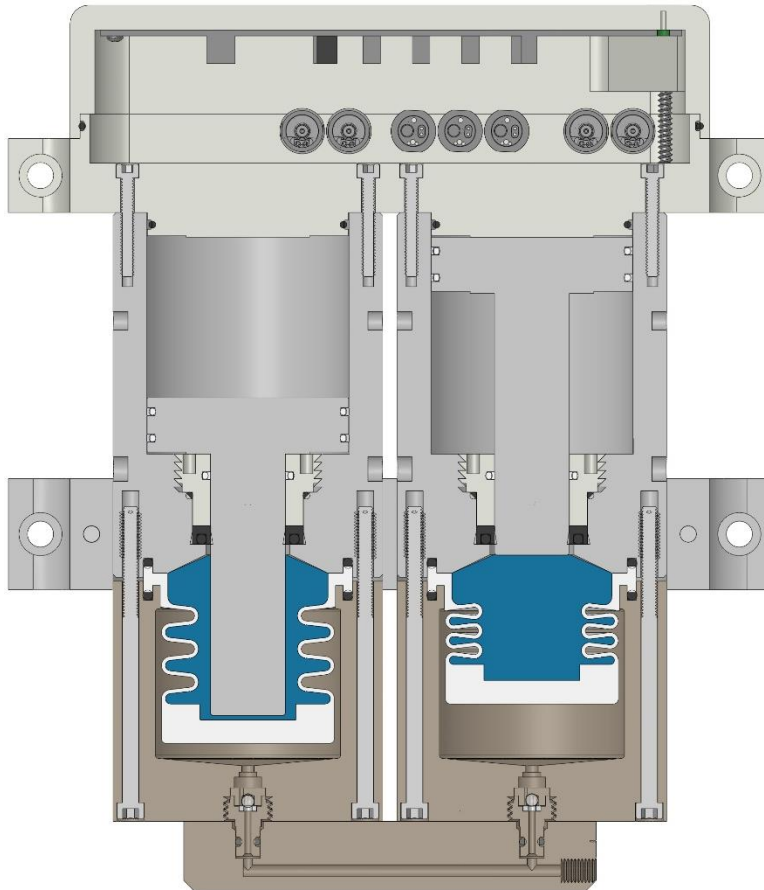
THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY WARRANTIES OF SUITABILITY FOR ANY PARTICULAR PURPOSE. NO VARIATIONS OF THIS WARRANTY BY ANYONE OTHER THAN THE PRESIDENT OF WHITE KNIGHT FLUID HANDLING IN A SELF-SIGNED AGREEMENT SHALL BE HONORED OR CONSIDERED LEGALLY BINDING.

Steve Smith, CEO
White Knight Fluid Handling

3 Specifications & Performance

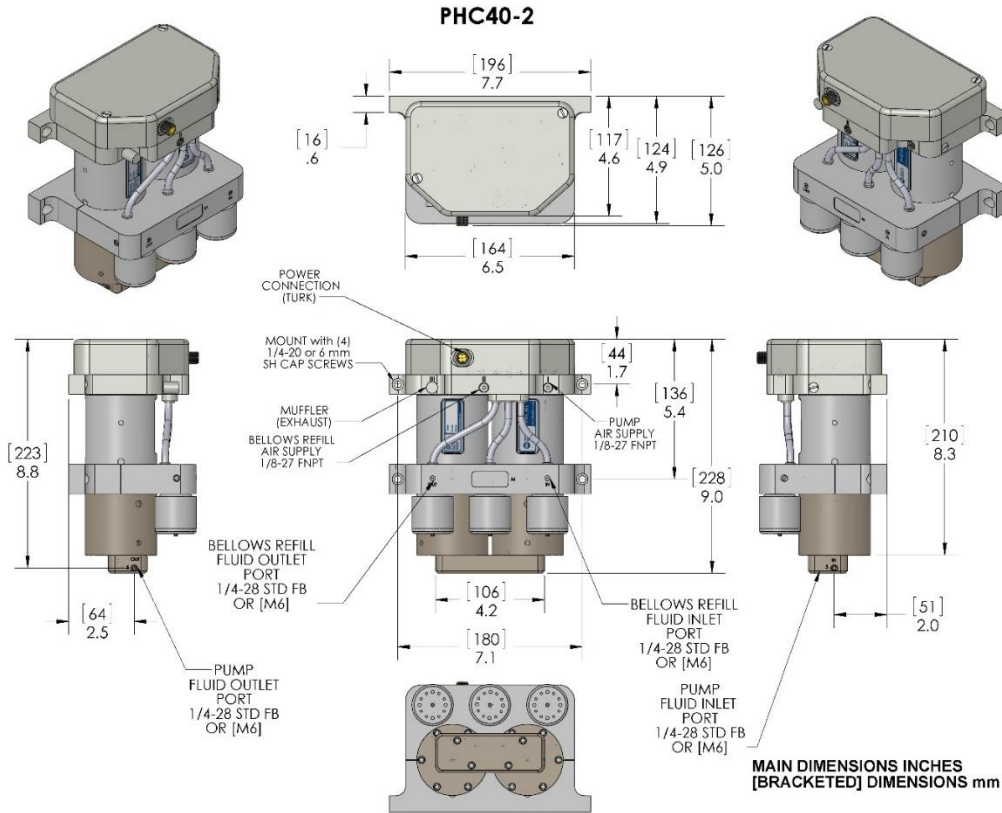
3.1 Pump Specifications

PHC40 Pump Specifications							
Max Flow Rate.	Max Discharge Pressure	Max Air Pressure	Cycles Per Minute ³	Air Consumption SCFM ⁴	Fluid Path Materials	Fluid Temperature range	Hydraulic Actuation Fluid
50 ml	40 Bar	7 Bar	3.3	1-3 SCFM	PEEK PTFE FFKM Sapphire	0-80°C 32-176°F	DI Water



Solenoid Valves	Turck Connector	On Board Controller
24V Manifold Valves 0.7 CV	5 Pin O-ring Sealed	Power: 24 VDC Max Power Consumption: 12 Watts Internal I/O: <ul style="list-style-type: none"> • Four 24 VDC Valve outputs External I/O: <ul style="list-style-type: none"> • Two PNP Compatible Input • One PNP Compatible Signal Output



3.2 Dimensions



4 Installation and Precautions

4.1 Precautions

Use of Electronically Controlled Metering Pumps
Electrically controlled pumps do not qualify for use in explosion proof environments.
Handling
DO NOT LIFT PUMP BY LIQUID FITTINGS, VALVES, OR AIR TUBING! DO NOT CONNECT / DISCONNECT THE PUMP WHEN THE POWER IS ON!
Air Supply
The auto refill version of this pump requires two air supplies; one for the pump operation, and one for the auto refill valves.
<ol style="list-style-type: none"> 1. The pump operation requires a minimum of 1.5 BAR and a maximum of 7 BAR air supply pressure ran through a minimum 1/8" ID airline. The fluid discharge pressures will exceed the air supply pressure; The PHC40-2 is a pressure multiplying pump fluid discharge will be multiplied 6x of supplied air pressure. 2. The auto refill valves require a minimum of 6 BAR and a maximum of 8 BAR to operate. The auto refill valves will only actuate during an auto refill process.
Dry Priming/Air Purging
The PHC40-2 requires a pressurized fluid inlet of 2 BAR. Operating the pump without a pressurized inlet will result in lower max flow rates and may reduce the life of the pump.

Pumping Slurries and Abrasives	
This pump is not recommended for pumping slurries or abrasives. Small fluid paths internal to this pump could get clogged easily.	
Restriction of Liquid Inlet Line	
Due to small orifice of the high pressure check valves the pump inlet is restricted and requires a minimum of 2 BAR of pressure to overcome the restriction and get full flow. This also applies to the auto refill fluid inlet port.	
Auto Refill Notice	
For long life of the PHC40-2 it is recommended that the auto refill be performed regularly as a preventative maintenance on the pump. The auto refill was designed to be performed in place in the tool and should be done as frequently as once a day. The pump should not be operated for periods greater than 2 weeks without performing the auto refill maintenance. Any time that it is noted that the pump's max flow is reduced, then an auto refill should be performed as a first step in the troubleshooting process. When performing an auto refill it is required that both the pump's outlet and the auto refill outlet be fully open to drain so that water and air bubbles are allowed to be evacuated from the pump.	
Cross Contamination	
PTFE and many other plastics are very porous and may retain chemicals in the pores of the material. Record chemistries used in a pump to avoid cross contamination.	
NEMA 5 Applications	
The PHC40 is capable of NEMA 5 classification. However this requires that the end user route the vent air to a safe location. The port is located on the front of the electrical housing and is assembled and shipped with a muffler to allow for immediate use upon arrival. The exhaust must remain clear of obstruction, or the motor housing cover will disengage. The exhaust port is 1/8" NPT, recessed in the motor housing.	
WARNING: Liquids and Gasses Under Pressure	
	While in a live system, pumps contain pressurized liquids and gasses. All pressure, liquid and air must be eliminated via shut off valves before the pump may be removed or detached from the system.
WARNING: Handling of Chemicals	
	In the event that hazardous chemicals are used in or around the pump, ensure that appropriate personal protective equipment is used before handling. Reference the chemistry's Material Safety Data Sheet (MSDS) for handling instructions or other information specific to that chemical.

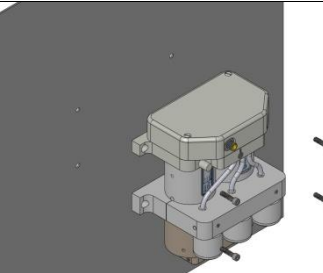
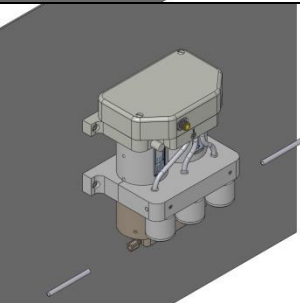
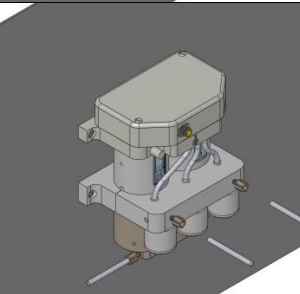
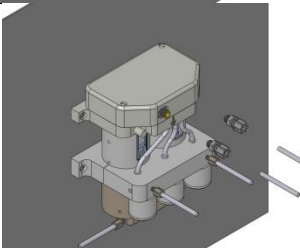
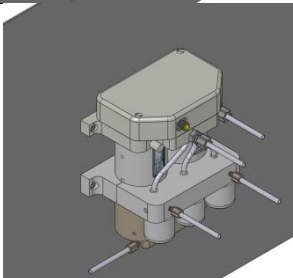
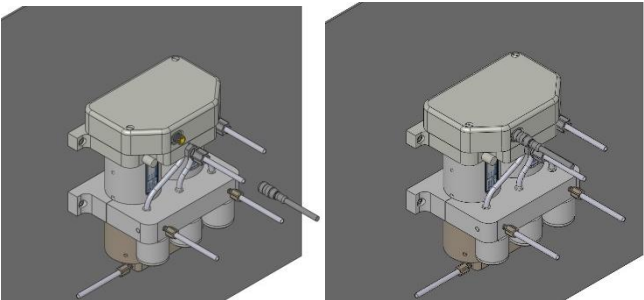
4.2 System and Pump Environment Recommendations/Requirements

Clean Supply Air (CDA)
White Knight high purity pumps require the use of Class 2 air for particles and moisture per ISO 8573-1. (Use 10 micron filter, maintain -40° C dew point)
Environmental Temperature
This pump is rated to withstand environmental temperatures up to 80°C.

4.3 Installation Advantages

High Discharge Pressure
The PHC40 is capable of discharging at pressures up to 40 bar.
Mounting Orientation
The PHC40 should be mounted with the fluid ports on bottom.

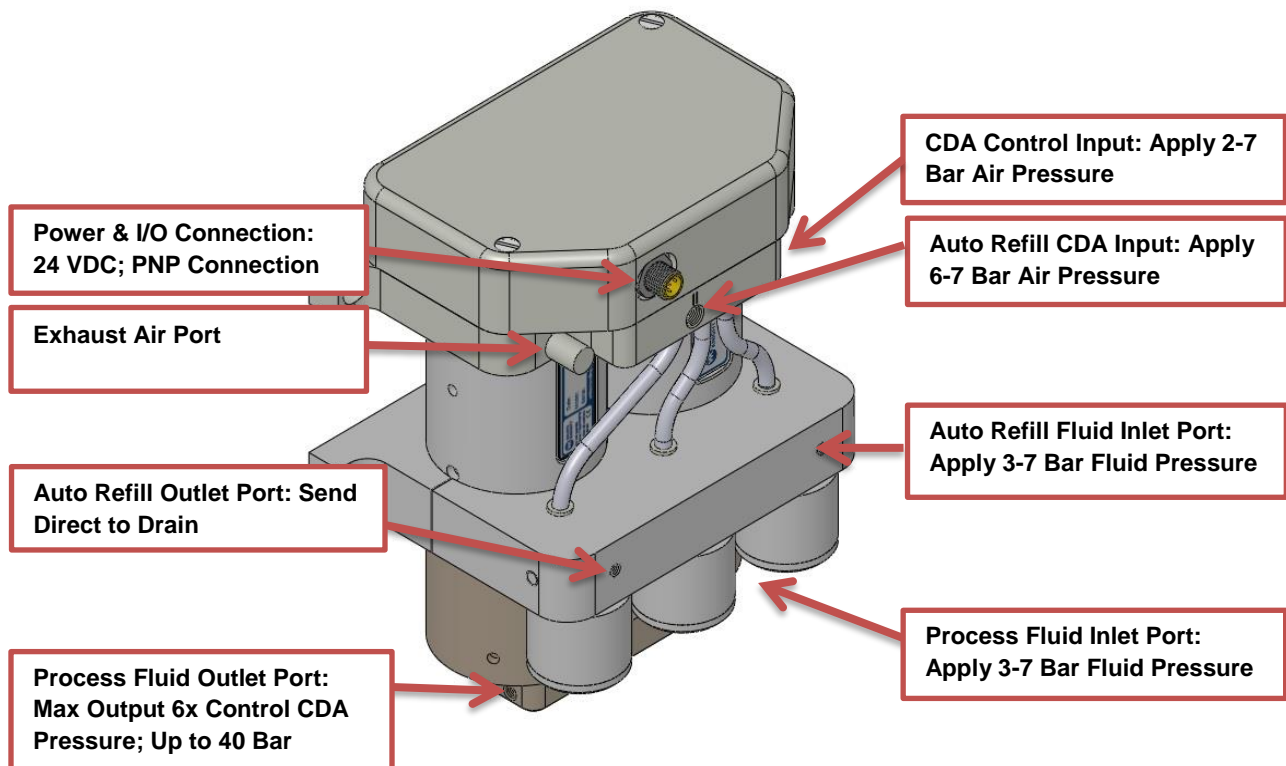
4.4 Installation Instructions

<p>1. Attach Pump to wall using two ¼-20 Bolts and predrilled and tapped holes.</p>	
<p>2. Attach liquid fitting and tubing to the liquid inlet per the manufacturer's instructions</p>	
<p>3. Attach liquid fitting and tubing to the liquid outlet per the manufacturer's instructions</p>	
<p>4. Attach air fitting to the 1/8in FNPT port on the front of the pump for the Air supply Line</p>	
<p>5. Attach CDA supply line to the fitting</p>	
<p>6. Attach Pre-wired Electrical connection to pump. (see wiring instructions in section 5.1)</p>	

4.5 Connections

The pump has 5 connections:

- **Fluid Inlet Port:** This port should be connected to a positive pressure supply line of 2-6 bar. This can be done by connecting the DI water supply line or the outlet of a booster pump to this port. The liquid fitting is a M6 or 1/4-28 Standard flat bottom connection.
- **Fluid Outlet Port:** This port is the high pressure outlet. Only components that are able to withstand the high pressure should be connected to this port. The liquid fitting is a M6 or 1/4-28 Standard flat bottom connection.
- **Auto Refill Fluid Inlet Port:** This port should be connected to a positive pressure supply line of 2-6 bar. This can be done by connecting the DI water supply line or the outlet of a booster pump to this port. The liquid fitting is a M6 or 1/4-28 Standard flat bottom connection;
- **Auto Refill Fluid Outlet Port:** This port should be connected to drain without restriction. It is used for refilling the pump's hydraulic fluid and evacuating any air bubbles trapped inside. The liquid fitting is a M6 or 1/4-28 Standard flat bottom connection;
- **Exhaust Air Port:** This port is to vent the exhaust air from the pumping operation. A muffler is connected to this port by default. If the user wants this air to exhaust to a remote location then the muffler can be removed and connected to a tube via 1/8" FNPT port. Do not plug this port.
- **CDA Control Input:** This port is to supply the CDA input pressure. The pump will use this air pressure to pressurize the discharge liquid. The discharge liquid pressure will be 6 times the CDA input pressure. Air fitting is a 1/8" FNPT port.
- **Auto Refill CDA Input:** This port is to supply the CDA input pressure. The pump will use this air pressure to pressurize the valves for the auto refill action. The valves require a minimum of 6 bar to open. Air fitting is a 1/8" FNPT port.
- **Power & I/O Port:** This is the electrical power port that supplies power to the on board controller and to the digital I/O. More information on the pin out and controls is found in section 5. Connection type male M12 5-pin receptacle made by TURCK.



5 Pump Control

5.1 Wire Connectors / Wire Leads

The PHC40 has one cables or Turck Euro Fast connector coming out of the front of the device. This connector both powers the on board controls and provides external I/O for the device.

Euro Fast Turck Connector Pin Layout

Connection Type	Turk Connector Pin # and mating wire color	Description
24 VDC	Pin 1 - Brown	Device Power: 24 VDC.
Digital Input	Pin 2 - White	Enable Pump Input: <ul style="list-style-type: none"> • 0 VDC input = Disable Pumping • 24 VDC Input = Enable Pumping (PNP Compatible signal) Note: if the pump is currently performing the auto refill, then the pump will not start till the auto refill is complete.
Ground	Pin 3 - Blue	Common Ground: 0 VDC
Digital Input	Pin 4 - Black	Pump Auto Refill Input: <ul style="list-style-type: none"> • 0 VDC Output = Inactive • 24 VDC Output = Start Auto Refill Process (PNP type output signal) Notes: This process will not start unless the pumping is disabled. The process will start once this signal is seen as true. The process will take about 2 minutes to complete. Pumping will not be allowed to start while this process is operational.
Digital Output	Pin 5 - Gray	Pump Operation Output: <ul style="list-style-type: none"> • 0 VDC Output = Pump Not Operational • 24 VDC Output Constant Signal = Pump Operational • 24 VDC Output Pulsed once a second = Auto Refill Active (PNP type output signal)

5.2 Pump Operation

The PHC40-2 has an embedded processor for operating the pump. The internal processor is able to actuate the air valves that control both the pumping action and the auto refill action. Below are the descriptions for operating the each action:

1. **Auto Refill Hydraulic Fluid:** The PHC40-2 uses a hydraulic actuation to generate the high pressure output. To ensure that high purity operation of the pump, DI water is used as the hydraulic fluid. During operation the hydraulic fluid can leak out, or bubbles can form in the reservoir. The auto refill process allows the pump to purge the hydraulic fluid out of the pump removing bubbles and refilling the hydraulic chamber with fresh DI water. When performing the auto refill routine make sure the system is setup as follows:
 - The enable signal to the pump is off.
 - The auto refill fluid outlet line is open to drain without restriction.
 - The auto refill fluid inlet line is pressurized with 2-6 BAR of fluid pressure.
 - The auto refill air supply is pressurized with 6-8 Bar of air pressure.

- The process fluid outlet line is open to drain without restriction.
- The process air supply is 4-6 BAR of air pressure.

Note: The fluid inlet to the process fluid can be open or closed; the auto refill will work either way. If you leave pressure to the process fluid then it will purge out the fluid in the process at the same time as refilling the bellows. If you close off the fluid inlet then no extra process fluid will get sent to drain; however, air could get drawn into the fluid lines and would need to be purged out before running the system again.

To start the auto refill process, send the auto refill start signal for 1 second. Once the process is started it will run for approximately 2 minutes. During the process the pump will open and closed the valves in the refill manifold and actuate the pistons in the pump in a sequence that has been tested to remove air bubbles in the hydraulic fluid. While the auto refill is performing the action the pump operational output will blink (one second on – one second off) until the process is complete. After the process is complete then the system can be restored to the configurations required for operation. This is a maintenance operation that should be performed at least every 2 weeks, and is recommended to be performed daily for best operation.

Note: Auto refill will not start if the pump is currently pumping. The “enable pump” signal must be turned off prior to starting the pump. Additionally, the pump will not start pumping (or be enable) while the auto refill action is being performed.

2. **Pumping Process Fluid:** The PHC40-2 is able to pump fluid using a 6x air pressure to fluid pressure multiplier. Fluid is pumped using two air pistons which actuate into hydraulic fluid behind the bellows, which then pass the pressure to the process fluid. The primary benefit of this design is that the piston actuation requires dynamic seal which would create particles in the fluid path. However, in this system the bellows separates the hydraulic fluid from the process fluid maintaining that no contamination enters into the process fluid.

Note: For simplicity the controller is design to cycle at the max flow rate; the actual flow rate is determined by the restriction in the fluid path (at the point of use). This means that there is only one operational speed for the pump and the cycle rate will not speed up or slow down depending on flow rate. Instead the flow rate will determine if the pump is getting full or partial strokes internal to the pump. If the pump is

To start the pumping the process fluid sent the enable signal to the pump for the duration that high pressure delivery is desired. To stop pumping stop sending the enable signal and the pump should stop pumping immediately. While the pump is operational the pump will output the operational signal. At startup the pump will refill both pistons then will dispense one piston at a time while overlapping both sides between refills to minimize pressure pulses.

Note: The pump is capable of providing 40 bar of pressure at flows up to 50ml per minute. If the system is not limited to 50ml via head pressure (needle valve or other) then max pressure will not be attained.

6 Pump Service & Rebuilds

6.1 Ordering Instructions

<https://wkfluidhandling.com/ordering-instructions>

White Knight Fluid Handling, Inc.

PHC40 Ordering Instructions

Required Configurations				
PHC40	-	2	-	B01
①		②		③
		-		E3
				-
				OR1
				④

Bold	= standard option
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Please select one option from each of the required fields (1 - 6). To configure your pump with different port fittings, optionally use sections 3-5 as needed. To configure sensor options or leak detection, please select options from the appropriate additional options (7-13).

① ② Number of Chambers and Air Fitting Configuration

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">① Ports</td> </tr> <tr> <td style="text-align: center;">2 = Two Chamber</td> </tr> </table>	① Ports	2 = Two Chamber	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">② Fitting Style</td> </tr> <tr> <td style="text-align: center;">B01 = M6 Flat Bottom</td> </tr> <tr> <td style="text-align: center;">B02 = 1/4 - 28 Flat bottom</td> </tr> </table>	② Fitting Style	B01 = M6 Flat Bottom	B02 = 1/4 - 28 Flat bottom
① Ports						
2 = Two Chamber						
② Fitting Style						
B01 = M6 Flat Bottom						
B02 = 1/4 - 28 Flat bottom						

③ Electrical Connection

E1	= 15' PVC Jacketed Cable
E3	= Turck Connector
E4	= Turck Connector with mating 6 meter pigtail

④ Oring Material

OR1	=FKM
OR2	=FFKM

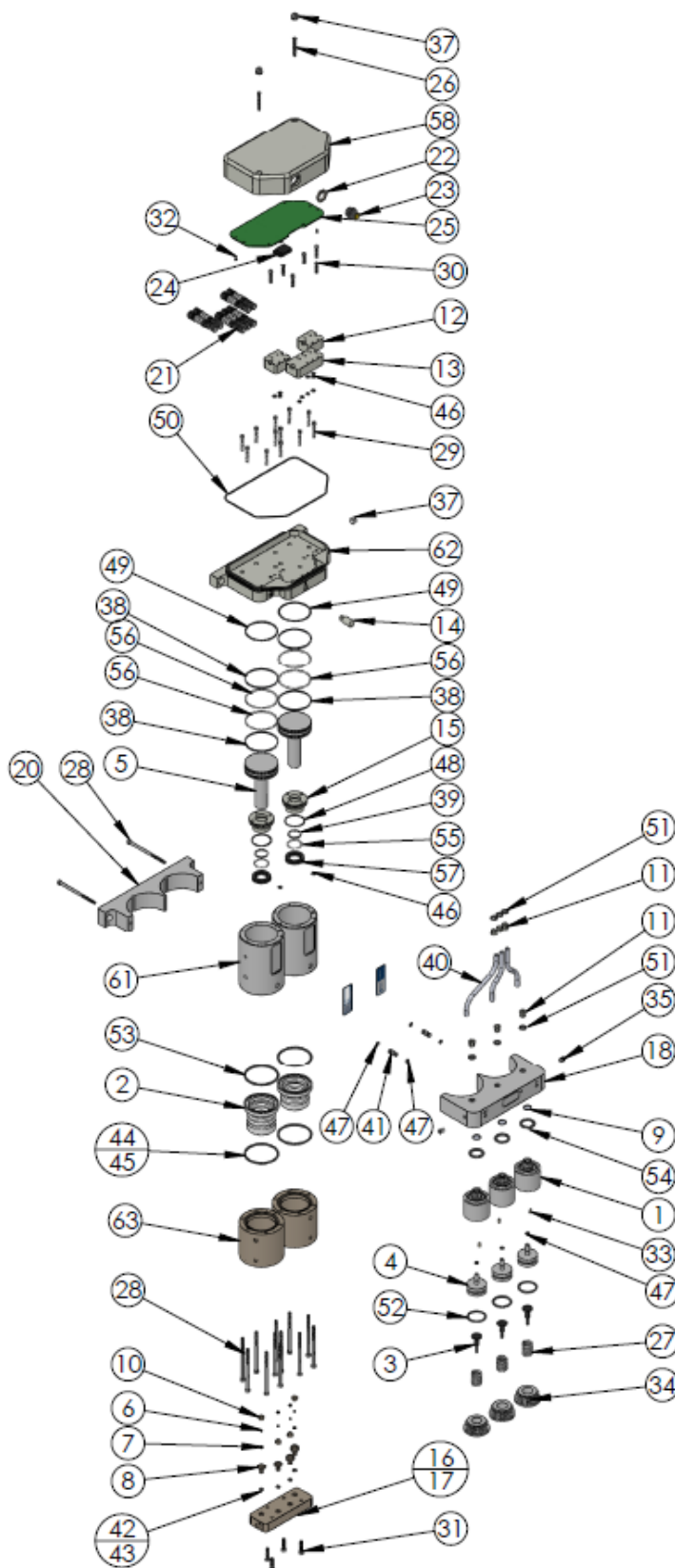
The following configuration has 2 Chambers, M6 flat bottom liquidn connections and turck connectors and FKM Orings;

PHC40-2-B01-E3-OR1

White Knight Fluid Handling, Inc. www.wkfluidhandling.com 435-783-6040

Please contact White Knight for orders requiring Copy Exact.

6.2 Pump Exploded View



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	1126-PT-0001	HIGH PRESSURE VALVE AIR BODY	3
2	3130-MP-0043	BELLOWS, PHC40	2
3	3135-BP-0002	HIGH PRESSURE VALVE SENSOR PISTON	3
4	3135-PT-0001	HIGH PRESSURE VALVE PISTON	3
5	3135-PT-0002	PISTON, HI-PRESSURE, 10ML	2
6	4100-SP-0001	1/8" CHECK BALL, SAPPHIRE	4
7	4135-SP-0001	SEAT, 1/8", SAPPHIRE	4
8	4140-PK-0002	PLUG, MANIFOLD, BALLCHECK, HI- PRE	4
9	4143-PF-0001	HIGH PRESSURE DIAPHRAGM SEAT/SEAL	3
10	4143-PK-0001	HI-PRESSURE CHECK,	4
11	6080-PP-0001	GRIPPER, .250, ONE-TOUCH	6
12	6091-NP-0010	MANIFOLD, BULLET-2, PHC010	2
13	6091-NP-0013	MANIFOLD, BULLET-3, PHC40-2	1
14	6110-PP-0003	POLY PRO MUFFLER 1/8" PORT SIZE	1
15	6600-PT-0002	PISTON, O-RING SLEEVE, PHC40-2	2
16	7500-PK-0003	MANIFOLD, PHC40-2 (Metric M6 FB)	1
17	7500-PK-0001	Manifold PHC40-2 (Standard 1/4-28 FB)	*
18	7500-PT-0001	MANIFOLD , BR, VALVES, METRIC	1
19	7500-PT-0002	Manifold, Valves, PHC40-2 (Stand	*
20	7500-PT-0003	MANIFOLD , BR, BRACKET	1
21	8600-XX-0028	VALVE, SOLENOID, BULLET, BV310A	7
22	8600-XX-0029	NUT, CABLE GRIPPER	1
23	8600-XX-0035	RECEPTACLE, TURCK, MALE	1
24	8600-XX-0044	PEM050 Quick Wire Connector, 6 Pin	1
25	8600-XX-0067	CONNECTION BOARD, PHC40-2, BAR	1
26	10010-SS-0037	SCREW, 1.250,	2
27	10010-SS-0044	SPRING	3
28	10010-SS-0046	SCREW, SH CAP, 8-32 X 3.00	14
29	10010-SS-0047	SCREW, SH CAP, 6-32 X 1.00 (full thread)	12
30	10010-SS-0053	SCREW, SH CAP, 6-32 X .750	6
31	10010-SS-0055	8-32 X .750 SH CAPSCREW	4
32	10010-SS-0057	2-28 PAN HEAD 3/16 LONG	2
33	10020-PK-0002	RESTRICTOR, .016 ORIFICE, PEM050	3
34	10040-PT-0001	HIGH PRESSURE VALVE CAP	3
35	10040-PT-0005	PLUG, 14-28 FB	2
36	10040-SS-0003	PLUG, BALL, 316 S.S., 3/32"	1
37	10040-TE-0002	1/8" NPT Plug	3
38	10050-UH-0018	SEAL, GLIDE, 2.045 X .076, .032 O-RING	4
39	10050-UH-0021	SEAL, GLIDE, .819 O.D. x .076, .019 O-RING	2
40	10070-PF-0001	Tubing PFA 1/4" thickwall	1
41	10070-PT-0001	TUBE, TRANSFER, PHC40-2	2
42	10080-FF-006-75	O-RING 006 X .070 (Kalrez)	4
43	10080-VI-006-75	O-Ring, 006 (Viton)	*
44	10080-FF-135-75	O-RING, 135 X .103 (Kalrez)	2
45	10080-VI-135-75	O-Ring, 135 (Viton)	*
46	10080-VI-005-75	O-RING 005 x .070	12
47	10080-VI-006-75	006 O-RING	7
48	10080-VI-024-75	-024 O-RING	2
49	10080-VI-032-75	O-RING, 032 X .070	2
50	10080-VI-050-75	O-RING, 050 X .070	1
51	10080-VI-108-75	O-RING, 108 X .103	6
52	10080-VI-120-75	120 O-RING	3
53	10080-VI-135-75	O-RING, 135 X .103	2
54	10080-VI-209-75	209 O-RING, 75 DUROMETER	3
55	10080-WV-019-60	-019 x .070 O-RING	2
56	10080-WV-032-60	O-RING, 032 X .070 (white)	4
57	10082-UR-0001	U-CUP SEAL, .750 X .188 X .188	2
58	10100-NP-0006	COVER, PHC40-2, BR	1
59	19100-PP-0110	LABEL, PRODUCT, PHC40	1
60	19100-PP-0111	Serial# Sticker for PHC40-2	1
61	14861-PT-0001	Body Assembly	2
62	14480-NP-0001	Cap Bracket Assembly	1
63	14100-PK-0001	Head Assembly	2

*alternate parts used based on configuration. QTY matches line immediately above item

6.3 Preventative Maintenance Schedule

This pump requires regular maintenance to insure that the pump will continue to operate uninterrupted.

Maintenance Operation	Frequency of Maintenance Required	Description
Hydraulic Fluid flush and refill	Every 1 -14 Days to ensure proper performance.	Pump can be refilled in location without removing the pump.
Replace Seals	After a year of operation	Entails replacing the piston seals and refilling the hydraulic fluid.
Full Pump Rebuild	After two years	Entails replacing controller, valves, check assemblies and bellows along with replacing the seals and refilling the hydraulic fluid.

Rebuild Parts for PHC40-2 Pump

Part Numbers	Description	Quantity
8600-XX-0028	Valve Assembly	4
3130-MP-0043	Bellows	2
14470-XX-0004	Inlet Check Assembly	2
14470-XX-0005	Outlet Check Assembly	2
14995-XX-0001	PHC40-2 O-ring Kit FKM (Air and Liquid)	1
14995-XX-0002	PHC40-2 O-Rig Kit FFKM (Air Side FKM)	1

6.4 Maintenance and Rebuild

6.4.1 Hydraulic Fluid Flush and Refill

- STEP 1. Make sure pump is not operational.
- STEP 2. Open valve down stream of pump in the process fluid line before any filtering or other restrictions and send to drain or recirculation.
- STEP 3. Close valve on process fluid inlet to pump.
- STEP 4. Pressurize Auto Refill inlet port with 2-6 Bar of pressure.
- STEP 5. If not already open make sure the Auto Refill Outlet port is open and sent to drain.
- STEP 6. Send 24 VDC to Auto Refill Start signal for 1 second.
- STEP 7. Watch pump operation signal. Signal will pulse true to false every second. When signal stops pulsing for more than 2 seconds you know the auto refill is complete.
- STEP 8. Return valves to the desired positions. (close valve in process outlet and open valve to process inlet)
- STEP 9. Resume normal operation.

6.4.2 Replace Seals

- STEP 1. Remove pump from tool
- STEP 2. Disassemble pump, use exploded view for reference.
- STEP 3. Replace the 3 piston seals each piston.
- STEP 4. Reassemble pump
- STEP 5. Fill the bellows with hydraulic fluid 3 times; same process as section 6.4.1
- STEP 6. Place pump in tool

6.4.3 Full Pump Rebuild

- STEP 1. Remove pump from tool
- STEP 2. Disassemble pump, use exploded view for reference.
- STEP 3. Replace the 3 piston seals, bellows, valves, controller, and check assembly
- STEP 4. Reassemble pump
- STEP 5. Fill the bellows with hydraulic fluid 3 times; same process as section 6.4.1
- STEP 6. Place pump in tool

6.5 Rebuild Information

Pumps requiring service under warranty must be returned to White Knight for warranty coverage. Options for out-of-warranty pumps are listed below.

1. Return the pump to White Knight for a full evaluation, failure analysis, and quote issued by White Knight or our local distributor. Upon the acceptance of the quote in the form of a purchase order the pump will be rebuilt as outlined in the quote. Pumps that undergo a full rebuild will be returned with a full renewal of its original warranty. Requests for Return Material Authorization can be filed online using the web form found here:

<https://wkfluidhandling.com/RMA>

6.6 Return Pump to Factory

1. After removing the pump from the station the pump must be flushed as described in the “Attention” section of this document, decontamination instructions and certificate of decontamination in section 6.4.
2. Remaining DI water in the pump should be drained from the inlet and outlet liquid tubing connectors. DI water on the supply/drive side may remain in the pump.
3. The pump liquid outlets must then be plugged per manufactures instructions
4. Dry the pump.
5. Double-bag the pump - **sealing it** in thick polyethylene bags.
6. Return the pump to its original packaging.
7. Include Material Safety Data Sheet (hereafter MSDS) in the box with the pump for any chemical to which the pump was exposed.
8. Obtain RMA number from White Knight, and write it on the outside of the box.
9. Ship to White Knight following all rules, regulations and laws regarding the shipping of dangerous materials. Ship freight pre-paid. No collect or COO shipments will be accepted. Unauthorized use of White Knight shipping accounts will result in additional freight costs to the bill as well as a service charge. Follow all shipping instructions in reference to sending your pump to its appropriate suite.

6.7 Decontamination Instructions & Certificate of Decontamination

PRINT COMPLETED DECONTAMINATION CERTIFICATION. IT MUST BE INCLUDED IN YOUR RMA SHIPMENT.

White Knight products are designed for use with caustic and otherwise dangerous liquids. Handle every product as if it contains dangerous chemicals whether or not it actually does.

- Only those with adequate safety training should attempt to handle used pumps.
- Wear adequate safety gear appropriate for chemicals that have been in the pump.
- Review relevant Material Safety Data Sheets (MSDS) before handling the pump.
- Review emergency numbers for use in event of an accident.
- Prepare Ph papers, showers, antidotes, clean-up equipment, neutralizers, and other safety devices used to detect, neutralize or minimize effects of chemicals described in appropriate MSDS documents.

Rinse with DI Water

Circulate DI water through pump for twenty minutes before disassembly and/or double bagging for shipment. If pump is nonfunctional, force DI water from inlet through outlet for 40 minutes before shipment preparations.

Remove Pump from Station:

1. Disconnect liquid tubing connectors from front of pump (opposite externally-mounted shuttle valve).
2. Plug NPT fittings with PTFE plug, Flare fittings with flare nose cover and cap, or other plug or cap as recommended by connector supplier.
3. Disconnect air supply tubing from face of shuttle valve.
4. Loosen mount screw from base plate. (Note: do not remove screw from base plate).
5. Remove base plate using proper tool for the fastening devices (e.g. Allen wrench or screw driver). Note: Base plate may remain if needed for a White Knight pump used to replace the returned pump.
6. Return all removed parts to the pump.

Return Pump to White Knight:

1. Rinse pump with DI water as described above after removing it from its station.
2. Drain remaining DI water from the pump inlet and outlet liquid tubing connectors.
3. Plug liquid outlets as described in the Remove Pump from Station section of this document.
4. Dry the pump, double bag it, and seal it in thick polyethylene bags.
5. Return the pump to its original packaging.
6. Include MSDS for the chemical that the pump was handling in the box with the pump.
7. Obtain RMA number from White Knight and write it on the outside of the box.
8. Ship to White Knight following all rules, regulations and laws regarding shipment of dangerous materials. Ship freight pre-paid. No collect shipments will be accepted. Unauthorized use of White Knight shipping accounts will result in the adding of freight to the bill in addition to a service charge.

Include All Pump Components:

Pumps returned to White Knight for evaluation, service or repair must be complete with all components, including but not limited to base plate, mount screws, tubing connectors, tubing connector caps, flare noses, shuttle valves, mufflers, and tubing. Missing parts will be added to the pump and charged to the customer.



Decontamination Certificate

COMPLETE AND PRINT THIS FORM. IT MUST BE INCLUDED IN YOUR RMA SHIPMENT.

I, the undersigned employee of _____, certify that all decontamination and safety procedures described in Decontamination Instructions section have been followed for return of product below.

RMA#: _____

(We cannot process returns without an RMA number.)

Serial#: _____

(We cannot process returns without a product serial number.)

Metal Exposure:

(Check all that apply. Write in other metals if necessary.)

- Product was **NOT** used in a Metal Process.
- Product was used in a **Copper** Metal Process.
- Product was used in another Metal Process (Non-Copper).
 - Aluminum Cobalt Gold Lead Nickel Platinum Silver Tin Titanium Tungsten Zinc
 - Other: _____

Chemical Exposure:

(Check all that apply. Write in other chemicals if necessary.)

- Product was **NOT** used in chemicals (DI Water only).
- Product was used in chemicals.
 - Ammonia Ammonium Hydroxide Hydrochloric Acid Hydrofluoric Acid Hydrogen Peroxide IPA
 - Nitric Acid Phosphoric Acid Sulfuric Acid Other: _____

Shipping Information:

Please indicate metal processes to which the product has been exposed by clearly and conspicuously labeling the outside of the return package with the metal.

Products exposed to Metal Processes must be sent to the following address:

White Knight Fluid Handling
187 East 670 South, **Suite B**
Kamas, UT 84036

Products **NOT** exposed to Metal Processes must be sent to the following address:

White Knight Fluid Handling
187 East 670 South, **Suite C**
Kamas, UT 84036

Print Name: _____

Signature: _____

Date: _____



187 E. 670 S., Kamas, UT 84036
435.783.6040 888.796.2476
<https://wkfluidhandling.com>

RMA Request Form

COMPLETE AND RETURN THIS FORM TO WHITE KNIGHT FOR RMA QUOTE AND INSTRUCTIONS.

Mail completed form to: 187 E. 670 S., Kamas, UT 84036 or email to: customer.support@wkfluidhandling.com.
RMA requests can also be made online at <https://wkfluidhandling.com/support/rma/>.

I, the undersigned employee of _____,
request a return merchandise authorization (RMA) for the product listed below.

Serial#: _____
(We cannot process returns without a product serial number.)

Product used with:	
<input type="checkbox"/>	Copper
<input type="checkbox"/>	Other Metal(s)
<input type="checkbox"/>	No Metal(s)

Reason for Return:
(Check all that apply.)

- | | |
|---|--|
| <input type="checkbox"/> Standard Evaluation <i>(See Purchase Order)</i> | <input type="checkbox"/> Return of Demo Product |
| <input type="checkbox"/> Maintenance or Service Repairs | <input type="checkbox"/> Exchange Product |
| <input type="checkbox"/> Product has problem: | |

(Check all that apply or write in other problems and/or details if necessary)

- | | | | | | |
|--|--|--|---|--|--|
| <input type="checkbox"/> Air Leak | <input type="checkbox"/> Fluid Leak | <input type="checkbox"/> Low/No Flow | <input type="checkbox"/> Non-Functional | <input type="checkbox"/> Erratic Operation | <input type="checkbox"/> Bellows Failure |
| <input type="checkbox"/> Check Failure | <input type="checkbox"/> Cycle Failure | <input type="checkbox"/> Shuttle Failure | <input type="checkbox"/> Shaft/Seal Failure | <input type="checkbox"/> Other: _____ | |

Failure Details: _____

Purchase Order: _____
(For standard evaluation returns, please provide a Purchase Order for \$200. If service is needed, this payment will be applied to the service.)

Air Supply Pressure: _____ *(Max or range in PSI or Bar. e.g. 80 PSI, or 80-90 PSI)*

Flow Rate: _____ *(Max or range in LPM or GPM)*

Process Chemistry: _____ *(e.g. HF, HCl, H2O2, etc.)*

Process Metals: _____ *(e.g. Cu, Au, Ba, Cd, Co, Ga, Ni, No, Pb, Pt, etc.)*

Process Temperature: _____ *(Max or range in °F or °C)*

Duty Cycle: _____ *(Max or range in PSI or Bar. e.g. 80 PSI, or 80-90 PSI)*

Product Installation Date: _____ *(Date of product installation)*

Additional Information: _____

Name: _____

Phone: _____

Email: _____

Signature: _____

Date: _____



Barclay-Phelps

CE MARKING SPECIALISTS
Hoi Yuen Road, Kwun Tong, Kowloon, Hong Kong

CERTIFICATE & DECLARATION OF CONFORMITY FOR CE MARKING

Company contact details:

White Knight Fluid Handling Inc.
187 E. 670 S., Kamas, Utah, 84036, USA

White Knight Fluid Handling Inc. declares that their:

Bellows Pump Line

PSA030, PSA060, PSA140, PSH030, PSH060, PSH140, PSU030, PSU060, PSU140, PSA025, PSA050, PFA030, PFA060, PFA140, PFH030, PFH060, PFH140, PFU030, PFU060, PFU140, PXA030, PXA060, PXA140, PXH030, PXH060, PXH140, PXJ030, PXJ060, PXJ140

Diaphragm Pump Line (Non Conductive)

PSD04TE, PSD06TE, PSD08TE, PSD16TE, PSD24TE, PSD04UH, PSD06UH, PSD08UH, PSD16UH, PSD24UH

Diaphragm Pump Line (Conductive)

PSD04TC, PSD06TC, PSD08TC, PSD16TC, PSD24TC, PSD04UC, PSD06UC, PSD08UC, PSD16UC, PSD24UC

Legacy Pump Line

PLS30, PLS60, PLS120, PLX30, PLX60, PLX120, PX30, PX60, PX120, PLF30, PLF60, PLF120

Metering Pumps

PPM100, PEM100, PEM050

Plastic Pumps

PHC40-2, PPMC300

are classified within the following EU Directives as applicable:

Machinery Directive 2006/42/EC
Low Voltage Directive 2014/35/EU
Electromagnetic Compatibility Directive 2014/30/EU
RoHS 2 Directive 2011/65/EU

and further conform with the following EU Harmonized Standards as applicable:

EN 809:1998+A1:2009 EN 60204-1:2006 + A1:2009 EN 61000-6-2:2005 EN 61000-6-4:2007+A1:2011

Dated: 16 January 2017

Position of signatory: Product Manager **Name of Signatory:** Cory Ammon Simmons

Signed below: on behalf of White Knight Fluid Handling Inc.

