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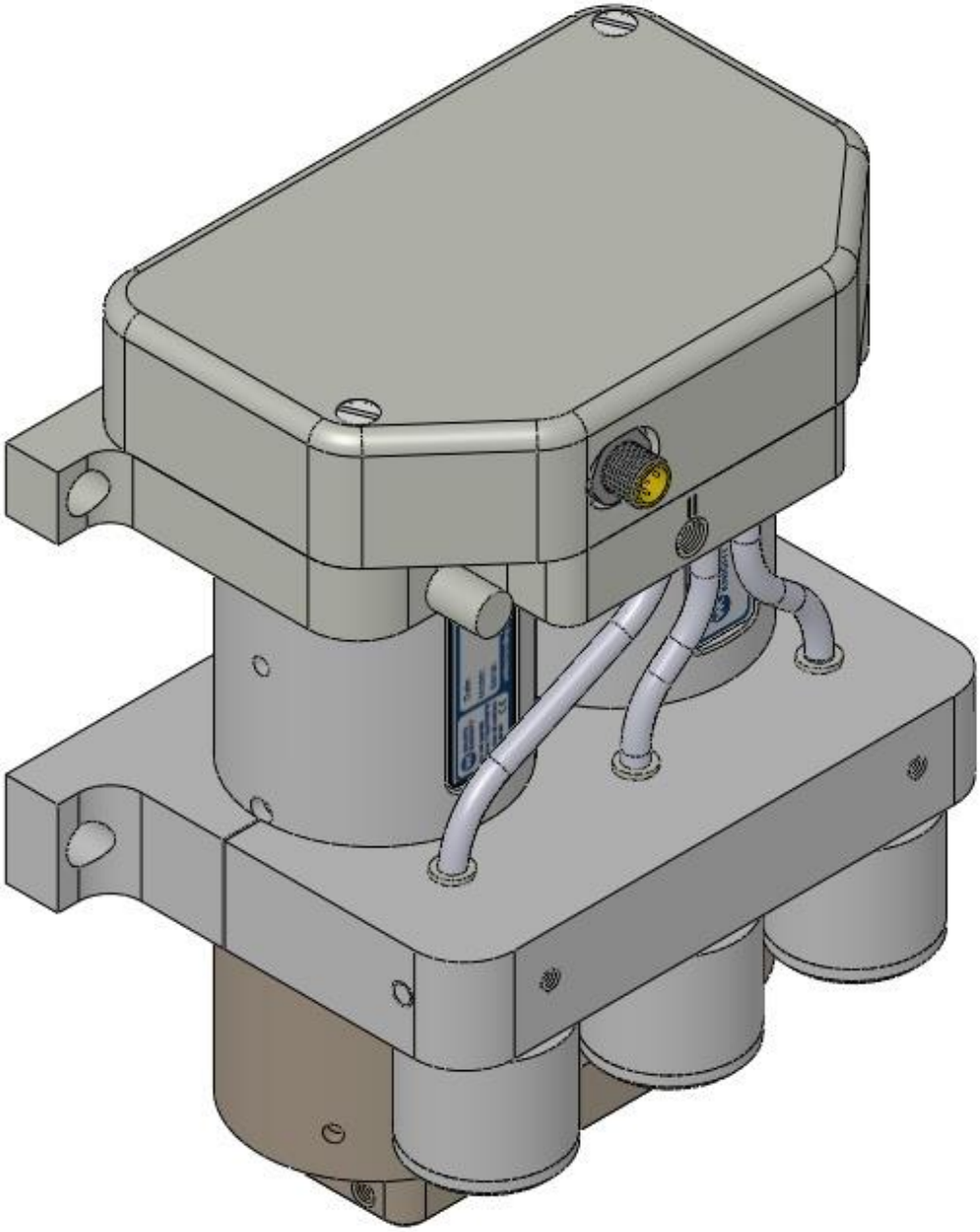
PHC40-2 Owner's Manual



Manual available online at wkfluidhandling.com

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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.

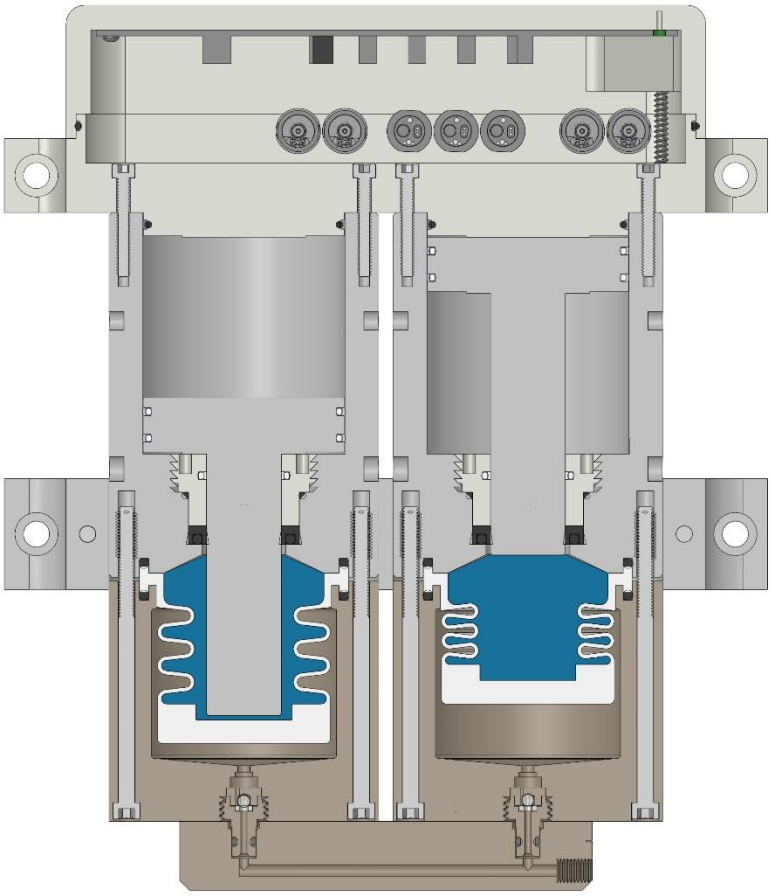
THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES EXPRESSED OR IMPLIED INCLUDING ANY WARRANTIES OF SUITABILITY FOR ANY PARTICULAR PURPOSE. NO VARIATIONS OF THIS WARRANTY BY ANYONE OTHER THAN THE PRESIDENT OF WHITE KNIGHT FLUID HANDLING IN A SELF-SIGNED AGREEMENT SHALL BE HONORED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

Steve Smith, CEO
White Knight Fluid Handling

3 Specifications & Performance

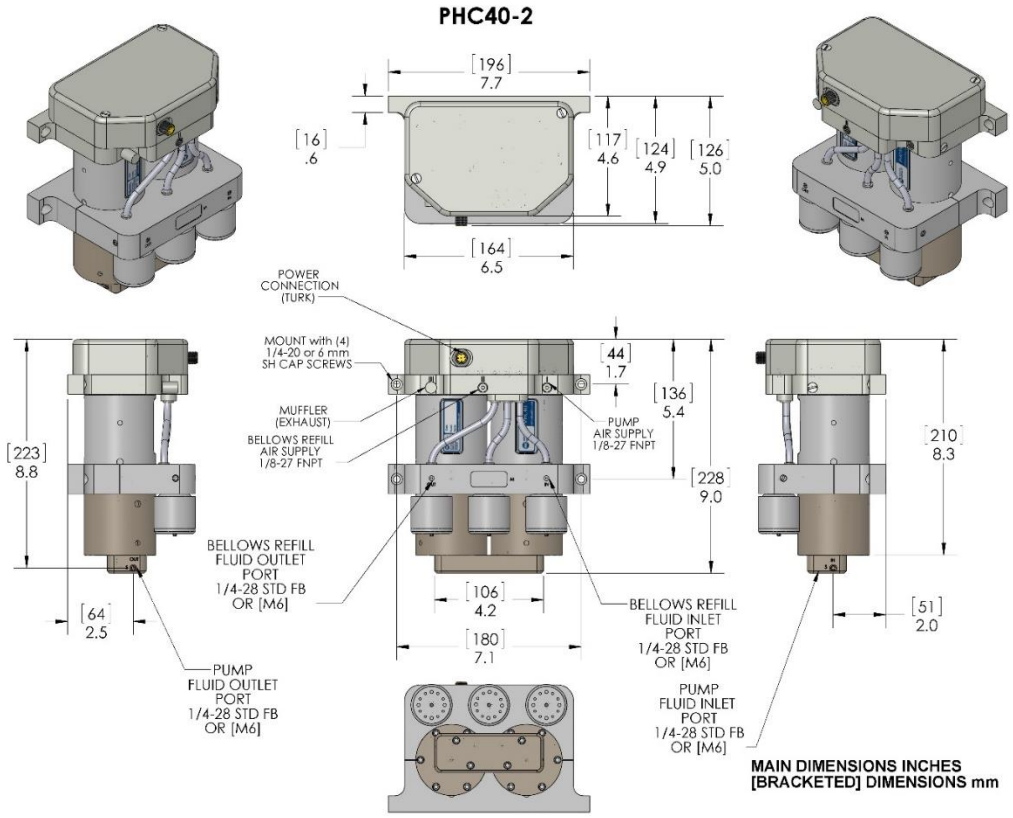
3.1 Pump Specifications

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: • Four 24 VDC Valve outputs External I/O: • 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. 1. The pump operation requires a minimum of 1.5 BAR and a maximum of 7 BAR air supply pressure ran through a minimum ⅛" 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 deigned 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 ⅛" 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.

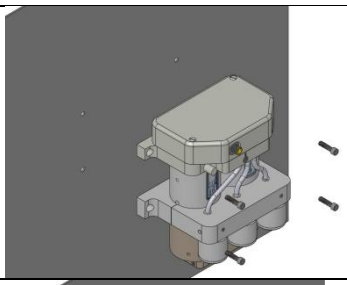
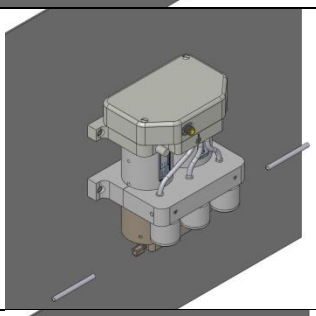
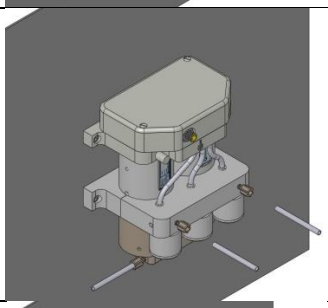
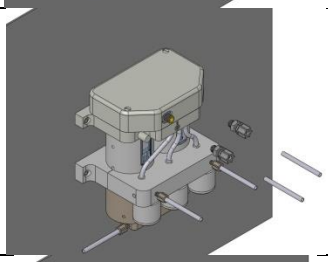
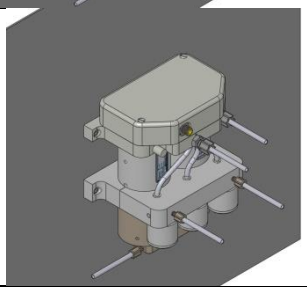
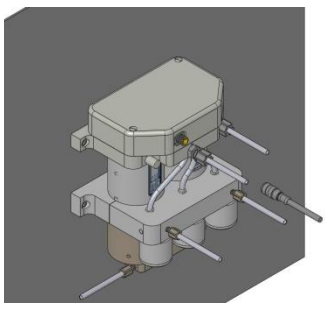
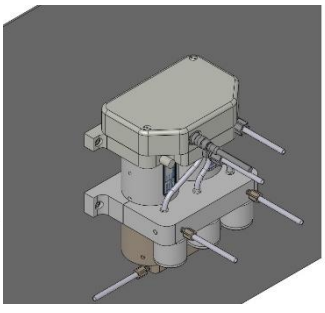
4.2 System and Pump Environment Recommendations/Requirements

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.

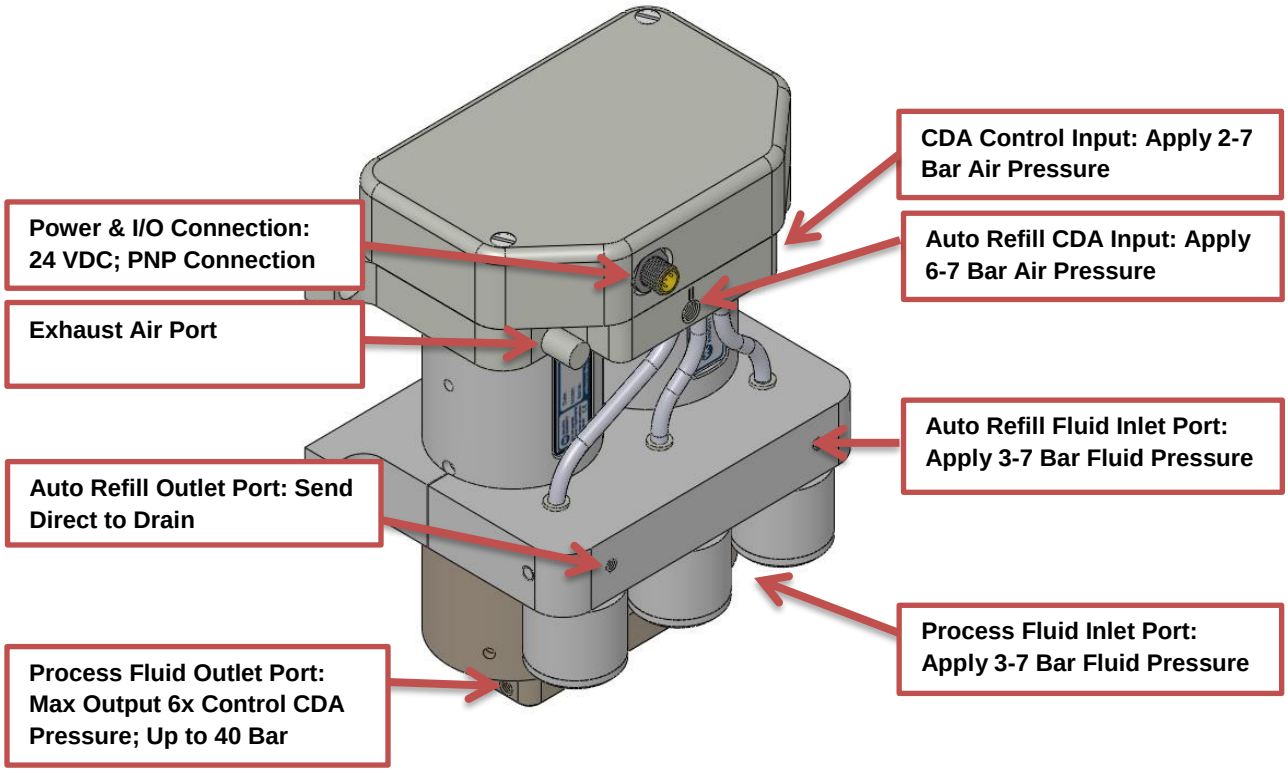
4.4 Installation Instructions

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

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: • 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: • 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: • 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.