IMPORTANT: READ THIS MANUAL THOROUGHLY BEFORE INSTALLING AND OPERATING UNIT. DO NOT RUN HEATER WITHOUT AT LEAST 1 GPM/3.875LPM OF OIL FLOWING THROUGH IT!

Operations Manual

PHX-110/220HEATER - Portable Inline Nema 4 Electric Oil Heater for optional use with Phoenix Membrane Oil Purifiers or FilClean Filter Carts
SECTION 1
PHX-110/220HEATER SPECIFICATIONS

FLOW RATE:
- MIN 1 GPM/3.875LPM
- MAX 8 GPM/31LPM

MAX OPERATING VISCOSITY
- 3 cSt to 3000 cSt

FLUID/OIL COMPATIBILITY
- OIL ONLY - MINERAL BASED, PAO AND POLYOLESTER *(Phosphate Ester Optional)*

MAX RECOMMENDED OPERATING PRESSURE
- 20 PSIG

THERMOSTAT MAX SETTING
- 120F/48.9C

THERMOSTAT ON CYCLING
- -10 F from High Set Point

MAX INLET OIL TEMP AND OVERTEMP HIGH LIMIT
- 240F/115C

EMPTY WEIGHT
- 170 LBS

INLET/OUTLET CONNECTIONS
- 1” Male JIC

HEATER TEMP FEED BACK LOOP
- ¼” JIC

DIMENSIONS
- 24” W X 19” D X 50”H

VOLTAGE
- 110 V/220V OPTIONAL

AMPERAGE DRAW NOT INCLUDING PHOENIX PURIFIER
- 8 AMPS

HEATER KW
- 1KW

DENSITY
- 12 WATTS/SQ IN
SECTION 2:
PHX-110/220 HEATER DESCRIPTION

The PHX-110/220 V portable or permanent modular inline heater is designed to work in series on the suction side (figure 2) of the MSC Filtration Technology Phoenix Membrane Oil Dehydrator and Purifier (figure 1). The Heater is meant to add extra heat to cold oils in order to speed up dehydration of free, emulsified and dissolved water from oils when using the Phoenix Membrane Dehydrator.

In most cases the oil heat generated by operating the gear box, lube or hydraulic system itself is enough to maintain adequate dehydration of oils when using the Phoenix Purifier. However, in situations where the gear box or lube and hydraulic system does not generate much heat, the oil is stagnant or the system is idle such as on the hydraulic system of an excavator then extra heat in the oil will help the process of water removal significantly. A general rule of thumb is that the water removal rate of the Phoenix Membrane Oil Purifier will double for every 20 degrees rise in oil temperature.

The PHX-110/220 Heater is a safe and simple set and forget low watt density heater which maintains the portability and simplicity of the PHoenix Dehydration Technology compared to large bulky standard dehydrators. The heater can (depending on the inlet temperature and volume of oil being filtered) raise the oil temperature into the PHoenix to a max of 120F and will automatically cycle between 110 and 120F when it achieves full temperature.
SECTION 3: PHX-110/220 HEATER COMPONENTS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual Oil Thermometer</td>
</tr>
<tr>
<td>2</td>
<td>Electrical Control Box</td>
</tr>
<tr>
<td>3</td>
<td>Heater Over Temperature Alarm Light – Indicates and trips heater above 240F. Auto Reset.</td>
</tr>
<tr>
<td>4</td>
<td>On/Off Electrical Button with Green Power Indicator Light</td>
</tr>
<tr>
<td>5</td>
<td>Adjustable Thermostat – Set at factory to max limit of 120F. Cycles at -10F of High Set Point</td>
</tr>
<tr>
<td>6</td>
<td>Outlet Connection to Suction of Phoenix Purifier. 1” JIC</td>
</tr>
<tr>
<td>7</td>
<td>Optional Heater Feed Back Loop Connections for 1/4” hose from PHoenix.</td>
</tr>
<tr>
<td>8</td>
<td>Inlet Connection from Gear Box, Lube or Hydraulic System 1” JIC</td>
</tr>
<tr>
<td>9</td>
<td>Heater Oil Drain</td>
</tr>
<tr>
<td>10</td>
<td>Heater Insulated Sheath/Housing</td>
</tr>
<tr>
<td>11</td>
<td>110V or 220V Power Cord with Plug</td>
</tr>
</tbody>
</table>

Figure 3
### SECTION 3: PHX-110/220 HEATER COMPONENTS-CONTINUED

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DRAWING NUMBER</th>
<th>DESCRIPTION</th>
<th>REPLACEMENT PART NUMBERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>PBLT105</td>
<td>MAIN POWER SWITCH PUSH/PULL</td>
<td>HT8LEDGF7 Green Bulb</td>
</tr>
<tr>
<td>13</td>
<td>LT114</td>
<td>HEATER OVERTEMPERATURE INDICATOR</td>
<td>HT8HFRV7 Red Bulb</td>
</tr>
<tr>
<td>14</td>
<td>CB102</td>
<td>15 AMP MAIN CIRCUIT BREAKER</td>
<td>BRY5266NP</td>
</tr>
<tr>
<td>15</td>
<td>CR112</td>
<td>HEATER OVER TEMPERATURE RELAY AND CUTOFF 240F SETPOINT</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>TS115</td>
<td>TEMP CONTROLLER HEATER THERMOSTAT FACTORY SET 120F MAX</td>
<td>PHX-THRM-120</td>
</tr>
<tr>
<td>17</td>
<td>CR112</td>
<td>HEATER OVER TEMPERATURE RELAY 240F SETPOINT</td>
<td></td>
</tr>
</tbody>
</table>

![Figure 4](image-url)
SECTION 4: PHX-110/220 HEATER INSTALLATION/OPERATION

IMPORTANT – DO NOT ENERGIZE HEATER WITHOUT ATLEAST 1 GPM OF OIL FLOWING THROUGH IT TO PREVENT COKING OF OIL. ALWAYS TURN PHOENIX ON AND INSURE FLOW BEFORE TURNING HEATER ON.

Step 1
Install Heater and Phoenix Purifier on a level surface next to each other as close to the Gear Box, Lube Oil or Hydraulic System as possible but not so close that 1” hoses will kink. Do not connect either units to electrical yet.

Electrical Note: 110V Heater Pulls 8 amps and 110V Phoenix can Pull up to 10 amps so depending on service it may be best to plug each unit into either a 20-amp single phase circuit or its own separate 15-amp single phase circuit to prevent circuit breaker overload.

Step 2
Connect 1” inlet hose from drain on Gear Box, Lube Oil or Hydraulic System to 1” bottom inlet connection of Heater.

Step 3
Connect 1” outlet hose from top of heater to inlet suction connection of Phoenix Purifier.
### SECTION 4: PHX-110/220 HEATER INSTALLATION/OPERATION

**CONTINUED**

**IMPORTANT** – **DO NOT ENERGIZE HEATER WITHOUT ATLEAST 1 GPM OF OIL FLOWING THROUGH IT TO PREVENT COKING OF OIL. ALWAYS TURN PHOENIX ON AND INSURE FLOW BEFORE TURNING HEATER ON.**

<table>
<thead>
<tr>
<th><strong>Step 4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Connect 1” outlet hose from outlet of Phoenix back to low pressure side of Gear Box, Lube Oil or Hydraulic System. One example is a T under the Breather of the oil reservoir as shown.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Step 5</strong></th>
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<tbody>
<tr>
<td>Plug Phoenix into power and energize. Insure there is oil flow in the spinning sight glass on the outlet of the Phoenix Purifier before proceeding.</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th><strong>Step 6</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Once oil flow is established through Heater and the Phoenix Purifier - plug heater into power outlet and energize by pulling on green power light on control box.</td>
</tr>
</tbody>
</table>
Section 5 Optional Heater Feed Back Loop

It may not always be necessary to do this however with some larger oil reservoirs or when the ambient temperature is very cold it may be difficult to maintain enough heat in the oil due to heat absorption from the system or ambient air itself. In order to help maintain oil temperature where it is most needed – at the membrane dehydrator itself- an optional heating feedback loop can be installed. This feedback loop allows for a portion of the oil flow from the Phoenix to be sent directly back to the heater suction itself. This preheats the oil coming into the heater and also continuously recirculates a portion of the oil directly between the heater and Purifier. This limits heat loss from the oil that might otherwise happen when the oil returns to the Gear Box, Lube Oil or Hydraulic Reservoir.

To connect this feedback loop, install the supplied 8’ ¼ heater feedback loop hose between either the sample valve on the Phoenix Purifier Particulate filter or Drain Valve on the Membrane Housing and return it back to the ¼” jic. restrictor orifice located on the cross above the suction side of the Heater. Leave both the drain valves on the PHoenix and the block valve on the heater cross completely open. The restrictor orifice will automatically limit the amount of oil returning directly to the inlet of the heater.
How to Maintain Flange Heaters

Maintenance of flange heaters is an important operational requirement for every industry that deploys them for their own applications. Maintenance has several advantages. (See Figure 1.)

Even though flange heaters may be properly installed according to the manufacturer’s instructions, the story doesn’t end there. Heaters may break down or catch fire if you do not take proper care of them.

The following are some precautionary steps you can take to make sure the heater is maintained properly:

1. Make sure you always unplug the heater before servicing it.
2. Check the heater periodically for signs of deterioration or formation of any crusts on it.
3. Clean the heating equipment regularly to prevent corrosion or deterioration. If there is any corrosion, check and replace the gasket if necessary.
4. Ensure there aren’t any loose terminals or connections. They could cause a short circuit.
5. Make sure the terminals or connections are clean.
6. Make sure the voltage is within specified limits. Voltages that are too high for the heater can permanently damage the heater and reduce its working life.
7. Do not operate the heater under dry conditions. Ensure the heater is always submerged with at least 2” of liquid above its heating elements to prevent overheating of the heater.
8. Make sure the heater is not touching any sludge at the bottom of the container. Regularly check for sludge or other deposits and remove any if found on the heater or in the tank.
9. If operating the heater in a closed tank system, ensure there is no air in the closed tank by making sure the tank is constantly full of liquid.
10. Make sure the pressure and temperature of the flange does not exceed the specified standards.
11. Use the most appropriate sheath material to cover the high resistance wires of the heater, taking into consideration the chemical composition of the liquid in which the heater will be immersed. If the sheath material corrodes, it could cause a ground fault which could ultimately lead to a fire or an explosion.
12. Make sure the heater is fitted with sufficient backup controls and safety devices to ensure nothing untoward happens during day-to-day operation of the heater.
13. If the flange heater uses a thermo well to control temperatures and prevent over-heating, make sure no moisture collects in the thermo well. This may damage the heater.

14. Do not run the heater with full power in low megohm conditions. A low megohm condition arises when the refractory material in the heater absorbs moisture and lessens the resistance of the cold insulation. This can cause tripping of the heater. If a heater has a megohm of 1 or less, it should be thoroughly dried before running the heater on full power.

15. Make sure vapors, spray, and/or condensation do not get in to the terminals of the heater. If necessary, use some kind of an enclosure to protect the terminals. Similarly, protect the heater from explosive vapors and dust.

16. Do not allow the liquid to reach its boiling point. This could result in a pocket of steam ultimately leading to overheating or even failure of the heater.

17. Use the appropriate watt-density, taking into consideration the velocity, operating temperature, viscosity, and thermal conductivity of the liquid being heated.

If you follow the above maintenance suggestions, your heater will give you a long lasting and safe service.

Figure 1
SECTION 7: TROUBLE SHOOTING GUIDE

This is only a guide. If these recommendations do not solve the problem, please contact your Sales representative for further help.

<table>
<thead>
<tr>
<th>PROBLEM DESCRIPTION</th>
<th>POSSIBLE CAUSE/SOLUTION</th>
</tr>
</thead>
</table>
| HEATER WILL NOT ENERGIZE or GREEN POWER LIGHT WILL NOT LIGHT | • Insure Heater is plugged into 110V/220V power and make sure there is power to that source.  
  • Check that the 15-amp circuit breaker in heater control box not tripped. Reset or replace if necessary.  
  • Disconnect Power to the Heater and make sure that all wiring inside is tight and  
  • Inspect Green Power Light Bulb is not Burned Out. Replace if necessary. See Page 4 for replacement. |
| POWER TO UNIT - BUT OIL WILL NOT HEAT OR HEAT TO ADEQUATE TEMPERATURE | • Make sure oil is flowing through Heater and not Stagnant.  
  • The max heating limit of this oil heater is 120F. If oil temperature into heater is above that then the heater will not heat further. Check inlet oil temperature to make sure it is below 120F.  
  • Install Heater Feed Back Loop – see page 7 figure 5.  
  • Unscrew Top of Heater Housing and insure that thermostat is set to 120F.  
  • If oil still will not heat this is a sign of a failed thermostat which requires replacing (contact MSC) or failed flange heater which can be replaced (contact MSC). |
| OVERTEMP ALARM                                           | • The heater is designed to trip off in the event that the oil temperature in it exceeds 240F. This may be caused by too high of oil temp entering the heater or from a failed thermostat that does not cycle off. If this happens please contact MSC to troubleshoot. |
| CIRCUIT BREAKER TRIPS                                    | • The heater will draw 8 amps when energized and the Phoenix will draw 5-10 amps. If it is found that your circuit cannot handle both units at once either switch to a 20-amp single phase circuit or energize the Phoenix and the Heater from separate 15 amp electric circuits. |
SECTION 8: Flushing Procedure

IT IS RECOMMENDED THAT WHEN USING THE HEATER AND PHOENIX WITH MORE THAN ONE TYPE OF OIL THAT THEY BE FLUSHED OUT BEFORE CHANGING TO ANOTHER OIL. THIS WILL PREVENT OIL CROSS CONTAMINATION IN RESERVOIRS.

STEP 1 – Turn Heater off and then turn Phoenix Purifier off 10-20 minutes after to allow oil and heater to cool. After 10-20 minutes turn power off on Phoenix.

STEP 2 – Disconnect inlet hose from oil reservoir. Remove any quick disconnect hydraulic coupling from end of hose so that air can be pumped through Heater and Phoenix.

STEP 3 - Leave outlet hose connected to oil reservoir so any oil can be pumped back in without loss.

STEP 4 - Power on Phoenix and allow oil to pump out and back into reservoir. Watch outlet Oil flow sight glass (see page 11 – item 6) till there is no more oil coming out. This should take approximately 1 – 2 minutes max.

STEP 5 - Check your Phoenix Manual Flushing guide in operations manual to see how to drain as much oil out of your Phoenix as possible. Put oil pan under heater drain valve (page 3 figure 3 item 8) and open draining as much left over oil out of the heater as possible. You may need to tilt the heater to get as much oil as possible.

STEP 6 - To prevent cross contamination of oil it is recommended that the Spin On Particulate Filter Element on the Phoenix be either removed and the oil poured out and then reinstalled or the element completely changed each time a different oil is used. To Install a new element, check your Phoenix Manual.

STEP 7 - Empty approximately 3-5 gallons of new oil into a 5 Gallon bucket with whatever type of oil the Phoenix and heater are to filter next.

STEP 8 - Insert inlet and outlet hoses into bucket and flush new oil through Phoenix for About 5 minutes. Do not energize the heater during this period. System is now flushed out and ready to run on new oil.
SECTION 9: Electrical Schematic