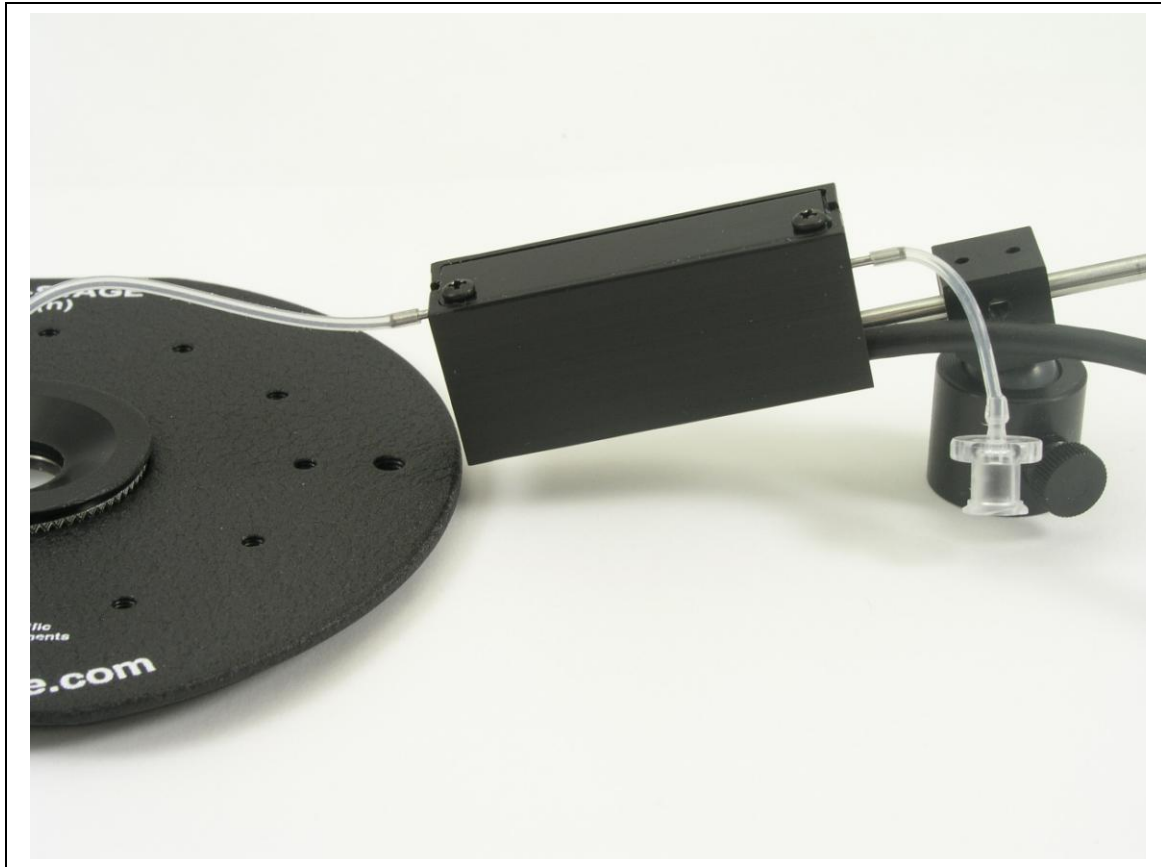


Instruction Manual

HPC-G

Heated Perfusion Cube G

V2.0 2015



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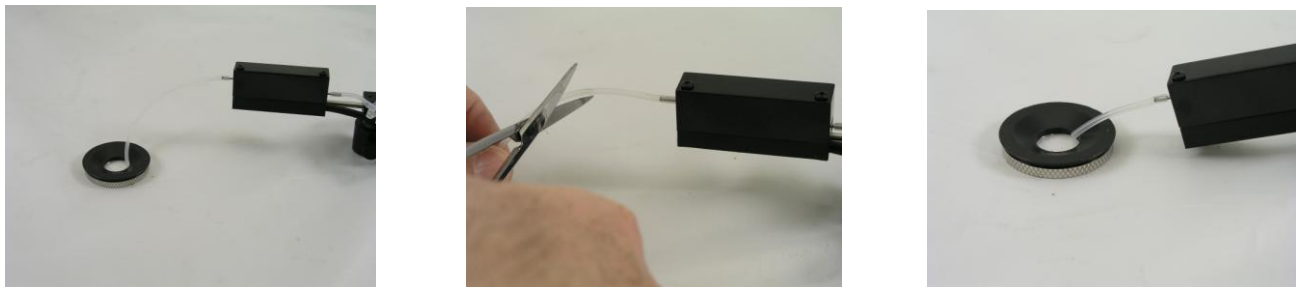
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OPERATION

The Heated Perfusion Cube G (HPC-G) is a high flow rate perfusion fluid heater. It is designed to heat a flow of liquid to a precise temperature before flowing into a cell bath. Flow rates of 10 ml/min can be accommodated with fluid heated from room temperature up to 40°C and above. Heating is accomplished with power resistors and all wetted surface areas are inert materials. The temperature sensor is embedded in the heated component of the device, but is also in contact with the fluid path way—this provides an accurate measurement of the fluid temperature and also prevents the system from overheating in the event it runs dry. The unit is serviceable and it can be opened and cleaned and re-assembled in the field. Please see the specifications table for all operating parameters.

Usage of the HPC-G is very simple. It must be connected to a qualified temperature control device that meets the specifications in the manual. Any temperature controller from ALA Scientific or npi electronic will work. The HPC-G should be the last device that fluid flows through before being introduced to the cell bath. Fluid to be heated enters the back of the HPC-G (The back end is the same side as where the mounting rod attaches) through a Luer fitting. It exits through the front where another piece of silicone tubing guides the fluid to the cell bath. This length of tubing should be kept as short as possible to be sure that the temperature of the exiting fluid does not have a chance to cool before it enters the cell bath.



Reduce length of output tubing as much as possible. A shorter output will give better thermal transfer.

Input to the HPC-G is via a Luer fitting to a short length of silicone tubing.



The HPC-G can be connected to a gravity reservoir, a peristaltic, or syringe pump.

Important Note: Upon first usage be sure to flush out the HPC-G with 50-80ml of distilled water to clean out any foreign material left over from assembly.

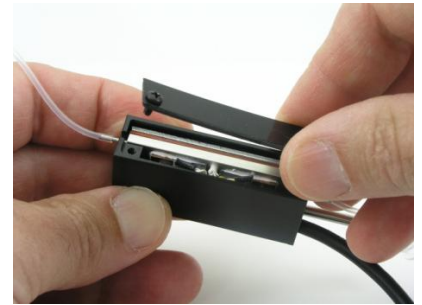
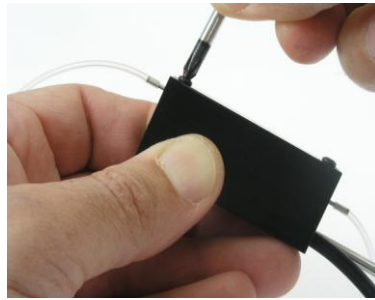
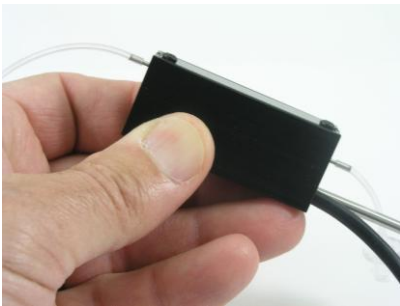
MAINTENANCE

The unit should be flushed out with distilled water after each day's usage. For disinfecting you can use any detergent or soap, methanol or ethyl alcohol. Vinegar and bleach can be used but care must be taken to wash them out with distilled water after a few minutes exposure.

The HPC-G can be cleaned out in the field. The chassis must be opened to reveal the heater core. The heater core is then opened. There is a rubber gasket that is removed. The rubber gasket can be cleaned or replaced if it is damaged. The rest of the heater core can be cleaned with alcohol or mild detergent. Only use a soft brush or cotton swab to clean the metallic parts. Do not use abrasives. Bleach can be used to disinfect, but must be rinsed off/out after a few minutes.

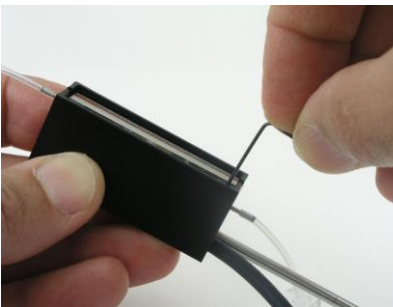
If you suspect that the inlet and/or outlet tubes are blocked, you can insert a short piece of wire to unclog the tubing. Flush out all debris with water.

Servicing the heater core

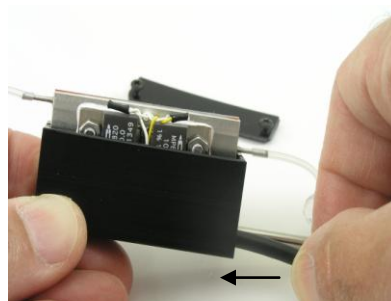


Remove the top screws from the chassis.

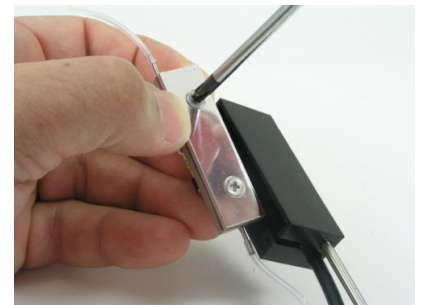
Remove Chassis cover



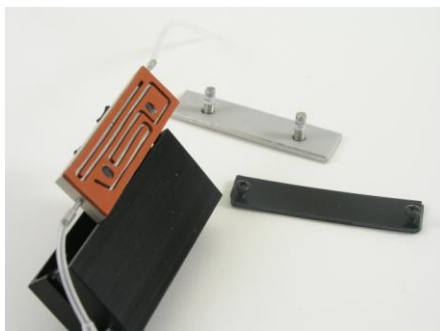
Use a .035inch (0.9mm) Allen Key to loosen the cable grommet set screw which is located deep in the rear



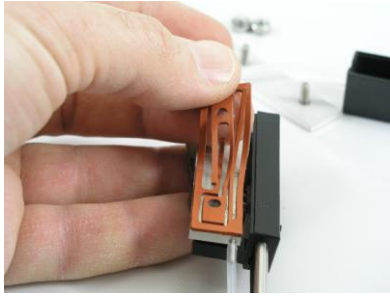
Push the cable in to move heater core assembly up and out.



Remove the screws of the heater core.

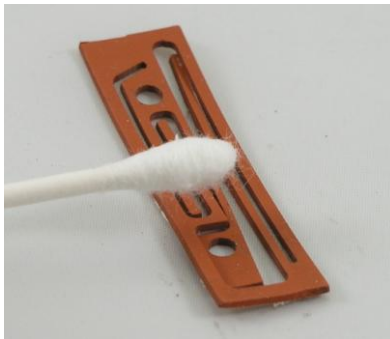
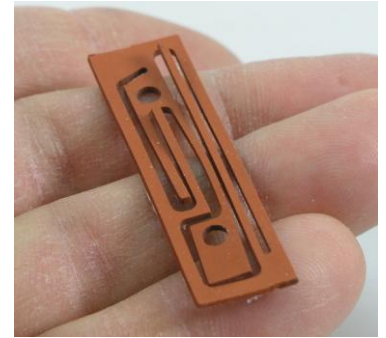


Open the heater core to expose the gasket.

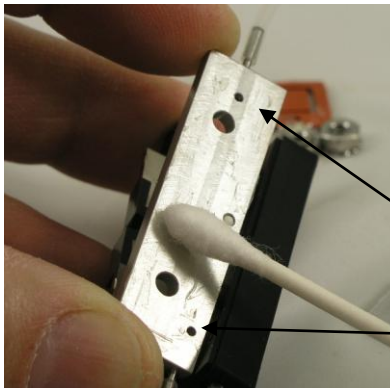


Carefully remove the gasket. If it is intact, it can be re-used, if it is damaged it must be replaced.
Order part number:

ALA-HPC-G-Gasket.



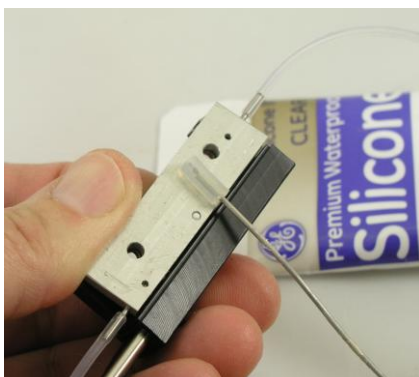
Clean the new or used gasket before it is returned to the HPC-G. Use a swab or wipe and alcohol to clean it.



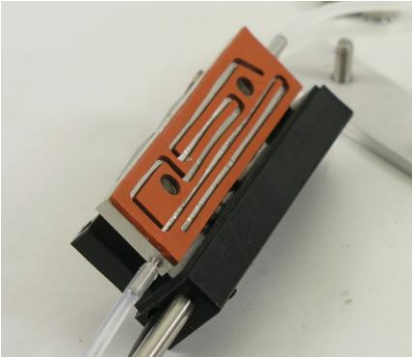
Clean the surface with a swab or wipe. **Do not use acetone or any cleaner with an abrasive.** Soap and/or alcohol is fine. Rinse with distilled or tap water.

Check that the input and output tubes and ports are clear. Open them with a small piece of wire if they are clogged and rinse with water.

In/out ports



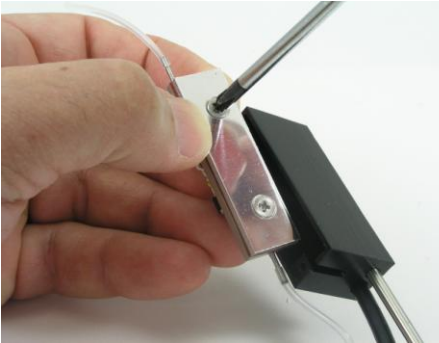
Before placing the gasket on the metal surface, apply a thin coating of silicone adhesive or petroleum jelly. This is necessary to hold and stabilize the gasket for reassembly.



Replace gasket.



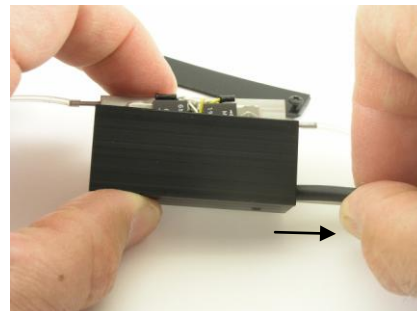
Use forceps to carefully align the channels of the gasket. The adhesive will hold it in place. Be sure all holes are lined up as well. (A narrowing of a channel will reduce flow.) In the case of silicone, allow it to cure before re-assembly.



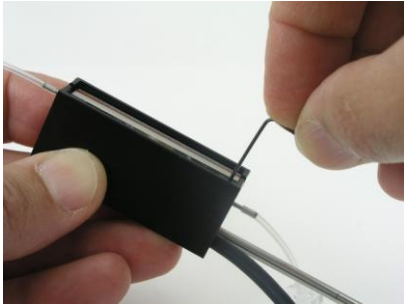
Replace the cover, and tighten screws until tension is felt, there is no need to tighten to the point of de-forming the gasket, mild pressure will be enough to keep the water tight seal.



Use a razor to trim any gasket material that bulges out at either end. A protruding gasket may make it difficult to replace the cover.

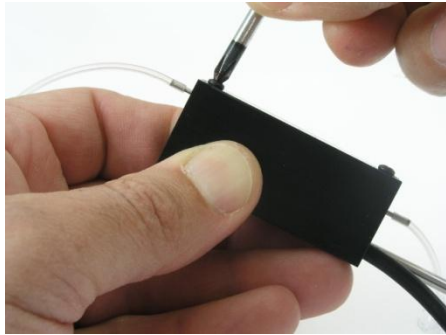
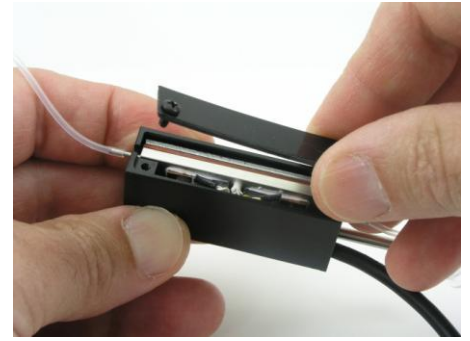


Pull on the cable to move the assembly back into the chassis.



Re-tighten the grommet screw only until resistance is felt, over-tightening can damage the cable.

Then replace the cover.



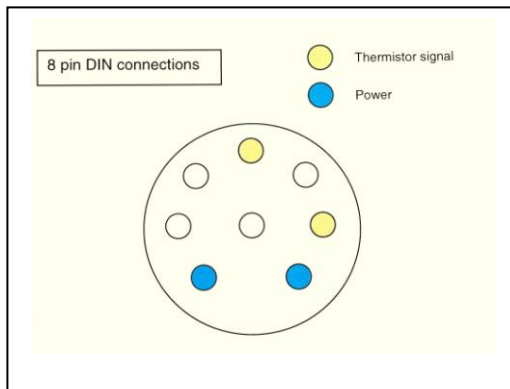
Only tighten the screws by holding the shaft of the screwdriver. They only need mild torque.



Return the HPC-G to use.

SPECIFICATIONS

Flow rate at 1 meter fluid height	8ml/min
Typical flow/temperature characteristic	Maintain 40°C at 10ml flow starting at 21°C
Size	51mm x 22 x 14
Weight	40g
Flow path	15cm
Wetted materials	Silicone, aluminum oxide alloy, 316 stainless steel
Capacity	40W @ 14V
Resistance	5 ohm
Voltage range	5-14V
Thermistor	2252 ohm at 25°C
Mounting shaft	3mm x 90mm
Input/output tubes	1mm ID
Nominal Internal volume (adjustable)	250uL
Electrical connection	8 pin DIN
Temperature differential at 5ml/min	1°C from internal reading to external sensor 8cm downstream



SAFETY INFORMATION

This is an electrically powered device used to heat flowing liquids. Since it is intended for biological applications those liquids may be electrically conductive. The user must be certain to follow the instructions in this manual and use this device according to its purpose which is for biological research in a non-clinical setting. If at any time the user suspects that the instrument is not operating correctly, i.e. is not heating up or seems to indicate a wrong temperature value, or is leaking, it is the user's responsibility to stop using the device immediately and contact their representative or ALA Scientific Instruments to arrange for repair or replacement. This device is only for use with DC voltage and must be limited to a maximum of 14V.

WARRANTY INFORMATION

ALA Scientific Instruments, Inc. agrees to warranty this equipment for a period of one year from the date of shipment against all defects in workmanship. Remedy will be limited to repair or replacement of the device at our discretion. This warranty shall not cover damage to the unit from usage beyond what is specified in this manual. We are not responsible for damage to, or resulting from, the use of this instrument. This device is for basic research only and has no clinical applications. The user is responsible for alerting ALA Scientific Instruments to any problems with the device in a timely manner. The user is responsible for return shipment to the factory on all covered warranty repairs.