Heating-Cooling Perfusion Cube
ALA-HCPC

Instruction Manual

Jan. 2010

ALA Scientific Instruments Inc.
60 Marine Street
Farmingdale NY 11735
631 393 6401
www.alascience.com
support@alascience.com

The Heating Cooling Perfusion Cube is designed to heat or cool a moving volume of liquid for use with a small cell chamber. The ideal flow rate is between 0.5 and 3ml/min. The output canula is about 25mm long, but results will be best if the unit is placed as close to the prep as possible. Typically, the temperature shown on the internal sensor will be within one degree of the output for the flow range listed above. The sensor is in thermal contact with both the "block" that the liquid flows through, and the liquid itself. Please keep in mind that the temperature of the out flowing liquid will decay rapidly. The further the output temperature is away from ambient temperature the more differential you may experience. The output tube is cut to 2.5cm. It can be shortened if necessary to prevent heat loss/gain in the output. Generally speaking, the most important thing is that the output tube be as close to the target as possible.

IMPORTANT INFO:

There are two very important things to note when using the HCPC. First, the power supplied to it cannot exceed 7 Volts. If it does, the unit will be damaged. Second, the HCPC needs cooling water to be sent through the heat exchanger. Cooling water can come form a CPU cooler, or from tap water connected by tubing to the heat exchanger.

LIMITING THE POWER

Limiting the power is easy with any of the npi temperature controllers. Each one features a "LIMITER" that sets a limit on the maximum voltage that can be output to a powered device. (Be sure that your controller will not exceed 7 volts)

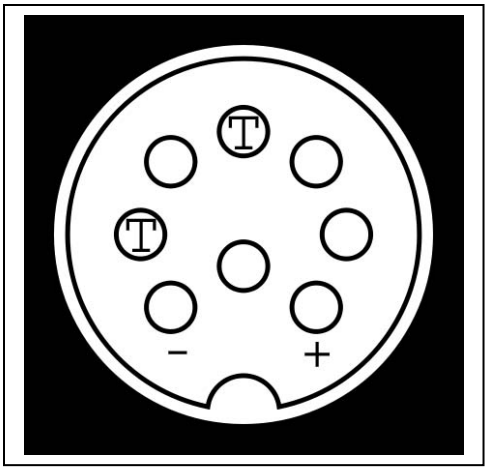
Notice the limiter on the PTC is set with the line at 12 o'clock. This will keep the voltage at just under 7 volts, in the safe zone. The limiter is active whenever the unit is in the control mode. It prevents the PTC from burning out the HCPC when full power is called for.

If at any time you need to check the voltage out to the HCPC, use a meter between these two outputs on the PTC.

Remember that when the mode switch is set to Direct, DC Voltage will be supplied to the HCPC. The amount will be set by the pin-wheels. The number you set represents a percentage of the full power that can be applied. The Limiter is by-passed in Direct mode, so do not set the value at more than 500, as this represents 50% of 14 Volts, or 7 Volts.

Power Connections to the HCPC

As you view the 8 pin DIN connector, the two pins marked with a T are connected to the thermistor (2252Ω type). Power for the unit comes in at the pins marked [+ and-].



Connecting Cooling Water

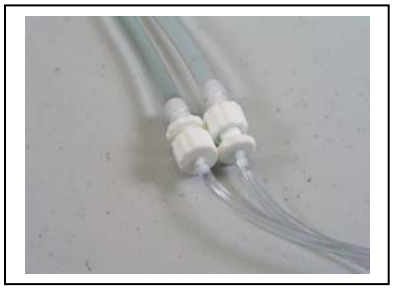
For proper operation in the cooling mode, the heat generated by the thermoelectric device must be removed. If it is not the thermoelectric will enter a feed-forward situation where heat will just continue to build up until the unit is damaged or destroyed. Proper removal of heat is easy as long as a flow of liquid, primarily water, of 300ml/min or more is maintained. The HCPC has two ports on the rear for connection to a water supply.

Connect a water supply to these brass fittings for cooling. Minimum flow of 300ml/min. is required for best performance. The perfusion solution should be fed to the clear connector just visible in the background, it is a female Luer fitting, or it can be removed and you can connect directly to the silicone tubing.

ALA supplies a CPU cooling device that is ideal for cooling the HCPC.

This particular model is from Koolance and it has the ability to remove over 1100W of heat so it easily can handle the needs of the HCPC which has a maximum heat output of between 30 and 40 Watts. The cooler is supplied with tubing attached, and the tubes have been equipped with quick connecting Luer fittings for easy set-up. The cooler should be placed on the floor near the rig, it need not be placed at the same height as the HCPC, but it will work best if it is no more than 1.2M below it. The cooler will have water and non-toxic antifreeze already loaded in it. If it requires additional filling, please see its manual for instructions.

To connect the cooler to the HCPC, all you have to do is connect the tubes from the cooler to the tubes on the HCPC. They are simple Luer lock connectors that just have to be twisted to connect. Be sure to make them just finger tight since the nylon fittings have a tendency to swell slightly from the water and can be hard to un-twist without a tool.



Two Luer fittings shown at left connect the cooler to the HCPC. When the HCPC is to be disconnected, connect the Luer fittings together to form a loop (right) so the fluid does not leak out. When connecting/disconnecting tubes always keep the connections 0.5-1M above the cooler to keep a siphon that will keep the liquid from leaking out during the process.

In order to operate the cooler the module shown at right must be attached, it provides a power input and a place to connect a thermal sensor. The senor is not used for the HCPC so it can be left coiled and used to monitor room temperature. It must be connected to position 1 to prevent an alarm.

Since CPU coolers are usually powered through the power supply of the computer, this one requires a 12V power adapter with wall transformer. The transformer is universal so it can work anywhere in the world. The power switch is located on top of the power module shown in the photo above.

When the unit is turned on, it will go to max fan speed for a short time and the pump will activate.

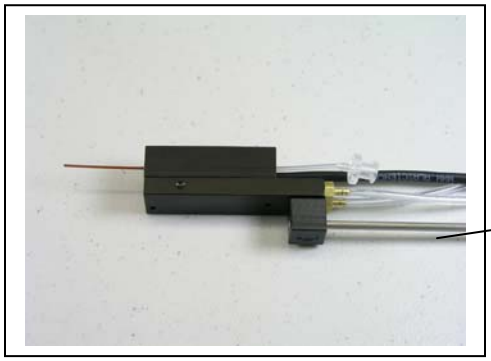
The front panel will display the temperature. There are three buttons. One will switch between F and C for the temperature monitor, the other buttons will allow manual adjustment of the fan speed (9 speeds) or select automatic. Typically the lowest fan speed is adequate for the HCPC even at 0°C set point. Adjust as necessary, warmer environments may require more air flow to get enough heat transfer. There is no pump speed adjustment.

(Just a note about thermoelectric devices: Thermoelectric devices, also known as Peltiers pump heat in one direction based on the polarity of the voltage applied. One side of the device gets cold while the other gets warm. The side that gets warm needs to have the heat removed if the cold side is to stay cold. Thermoelectric devices have a fixed ΔT between the two sides. For the one used here it is about 67°C. It means that under relatively optimum conditions the hot and cold side of the thermoelectric will be about 67°C different. So, the cooler you can keep the hot side, the colder the cold side will be.)

Connecting your Perfusion Source To The HCPC

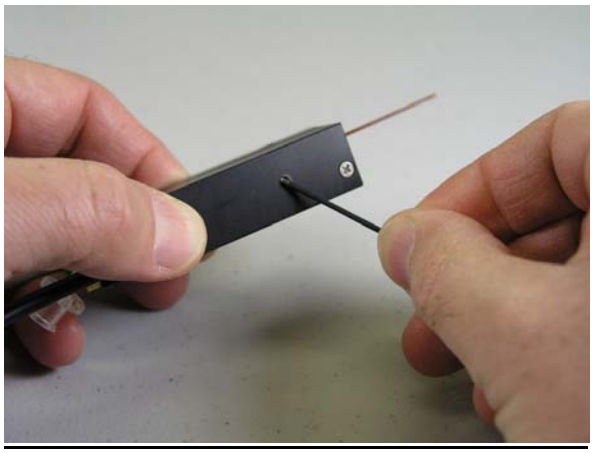
The input of the HCPC is silicone tube equipped with a female Luer connection. The ID of the silicone tube is about 1mm so most ALA manifolds can be connected directly to the tubing if the Luer is removed. Otherwise your perfusion system can be coupled to the HCPC with a male Luer.

Mounting Options



The HCPC can be mounted on a magnetic base with a swivel as pictured above, or via mounting rod (3.2mm 1/8th in.) Rods are about 10cm long.

Flow Adjustment



On top of the unit is a small set screw, the thread is 4-40 (Use .050 standard Allen wrench) . It can be used to loosen and tighten the seal of the perfusion pathway. Typically it is factory set to a tight position which limits the amount of fluid that can be in the fluid path. This lowers the dead volume, but slows the flow rate. This screw can be loosened up to one full turn to increase the flow rate and lower resistance to flow. Just be sure not to loosen it to the point of leaking.

Service and Cleaning

Always flush the HCPC with distilled water after every use. Be sure at least 50cc of distilled water flows through the HCPC. It is also good to push out the remaining water with some air if possible and store the unit dry.

Never submerge the unit, never let the unit run in the cooling mode without cooling fluid flowing. Clean the surface of the unit with a damp cloth or paper towel. Do not use acids or strong bases with the HCPC. Internal o rings are silicone so do not use any solvents incompatible with silicone. Never use acetone.

If it should become necessary to clean the inside of the HCPC fluid path, it is possible to do so. Two screws on the top of the chassis can be removed and as the cover is raised, the fluid carrier will be exposed. We suggest soap and water and a toothbrush. If you need greater access to this part, then you need to loosen the set screw that holds the cable in place on the chassis, and slide the cable into the chassis to gain more access. Simply put the device back together the way it came apart, (be sure the o-ring is aligned with the thermoelectric) and it will resume proper operation once all screws are tightened up. There is also a pressure plate on top of the fluid carrier that must be returned to its proper place. (Please contact the factory for further support on disassembly and cleaning: support@alascience.com.)

Specifications

Weight	Approx. .050 Kg
L x W x H (w/o tip or mounting rod)	640 x 16 x 32mm
Tip length	25mm
Tip Diameter	0.5mm
Mounting Rod	100 x 32mm
Max. flow rate	10ml/min
Min. flow rate	0.5 ml/min
Max. power	15 W
Max. cooling	9 W
Thermistor type	2252Ω
Coolant flow requirement	<300ml/min
Maximum Voltage	7.0V
Max. Amps	2.1A

Warranty

ALA Scientific Instruments agrees to warranty this device for a period of one year from the date of shipment. This is a limited warranty in that damage resulting from misuse or failure to follow directions will not be covered. Warranty is limited to repair or replacement of the device at ALA's discretion. Claims are limited to defects in workmanship which includes leaks, o ring failure, structural, or electronic failure do to defects in manufacturing. Damage do to over heating, frost formation, high humidity, condensation and/or poor lab protocol such as failure to flush out the device after each usage will not be covered. Damage resulting from unauthorized repairs will not be covered. Chemical damage from the use of acids or acetone will not be covered. Your warranty rights may vary form state to state or country to country.

Contact your distributor or support@alascience.com for repairs and information on service.