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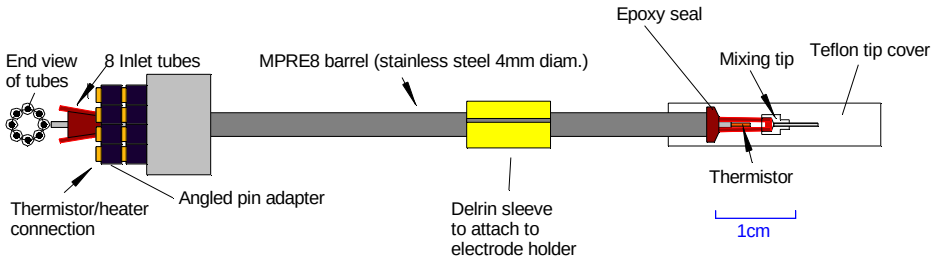
Equipment for cellular & electrophysiology research

MPRE8 8 channel Pre-heater

Description

The **MPRE8** Multi-tube pre-heater is an 8 tube pre-heater for either superfusion or for the inflow of a tissue chamber. It has a very small mixing volume at the tip (≈1-2µL) which allows rapid switching between solutions (<<1sec). Switching can be achieved using valves or using our **cFlow** 8Channel Flow Controller to operate pinch valves.



MPRE8 Multi-tube pre-heater

The unique construction of the **MPRE8** permits the use of a single thermistor sensor so that it is compatible with the **TC2bip** Bipolar Temperature Controller (using Aux channel) and other controllers using a 10kΩ thermistor sensor. Solution can also flow in multiple tubes for mixing applications. Temperature control is possible of flow rates up to 1ml/min. This flow rate can be achieved with a head of 1m. The **MPRE8** tip is has an outlet tube with a 360µm inside diameter. The mixing tip can be removed and replaced if necessary. The outlet tube can also be drilled out and replaced if it is broken.

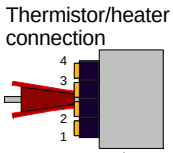
Performance of MPRE8

For flow rates up to 1ml/min the fluid in the tubes will reach a steady-state temperature before it reaches the outlet. We have positioned the thermistor sensor to minimize the difference between the sensor in the **MPRE8** and the outflow temperature. The outflow temperature will be 1-2°C below the sensed temperature. This difference will be large at higher flow rates. We recommend that you independently verify the outflow temperature (using a miniature thermistor in the outflow stream) if the exact outflow temperature is critical in your experiments.

Typical input powers for flow of 0.9mls/min are 2.0Watts; for 0.5ml/min 1.1Watts. In preliminary testing the outflow the temperature measured at the end of the fused silica outlet tube varies less than 1°C for flow rates from 0.8mls/min to 0.2ml/min. The outflow temperature increases about 2°C after halting and restarting flow (at 0.2mlmin).

Electrical connections

The **MPRE8** is normally connected to the **TC2BIP** Aux channel. The cable is identical to the **HPRE2** cable. The banana plugs go into the OUTPUT Aux while the 6mm phone jack connects to the Aux Probe Input via the adapter cable supplied with the **TC2BIP**. The P_{Aux} should be set to 50% and G_{Aux} to 0. With G_{Aux} set to 0 the output voltage will be limited to about 5V which a safe maximum voltage. Since the outflow is 1-2°C below the sensed temperature you may want to offset the internal setpoint for the Aux channel using the TAuxOff control (see **TC2BIP** manual).



1,4 Heater input
2,3 Thermistor

Tubing connections-YOU MUST READ THIS!!!

We have provided 4' of Tygon microbore tubing (0.02" ID; P-06418-02 Cole Parmer 800-323-4340) to make connections to the **MPRE8** inlet tubes. Make sure you are using a magnifier or dissecting microscope so you can see clearly the inlet tube when you attach the tubing.

Attachment

1. Block off any unused tubes using the 1/50"ID silicon tubes provided (one end is sealed with silicon glue).
2. Cut the Tygon microbore tubing to a suitable length.
3. Expand the end of the Tygon microbore tubing using the closed the tips of a pair of blunt forceps or similar. While the tubing is still expanded press onto the MPRE8 inlet making sure that you don't bend the inlet. Tygon microbore tubing rapidly relaxes back to its original size so if you take too long to press on the tubing use the

…over

forceps to expand it again. The Tygon tubing should easily press onto the MPRE8 inlet. To connect to the Tygon microbore you can use the supplied tubing (www.smallparts.com CFT-01C PVC 1/16"ID x 1/8"OD). From this tubing you can use 1/16" barb connectors (eg 06365-44 1/16-1/8" barb or 06359-25 1/16" barb to female Luer Cole Parmer).

Removal

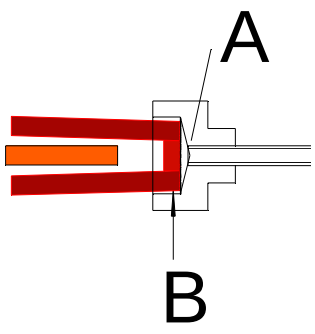
1. You must have a magnifier or dissecting microscope so you can see the inlet and tubing clearly.
2. Holding the MPRE8 firmly in one hand and the Tygon microbore tubing close to the inlet (<1cm from inlet) pull the Tygon microbore tube straight back. It should come off the inlet easily.

Priming

Like all devices using small capillaries you will need to prime the tubes with solution. To do this you can use a 1cc syringe fitted with a piece of 3/32" ID silicon tubing (3/32" ID 5/32" OD; 06411-63 Cole Parmer). Push the tubing over the tip and apply suction till all the tubes that are being used are filled with solution. This doesn't need to be the final solution since with the small deadspace of the **MPRE8** it is easy to flush out the priming solution.

Precautions/notes

1. Take care of the **MPRE8**. The glass tubes **cannot** be disassembled for repair.
2. Wash and then drain the fluid from the **MPRE8** after each use to prevent things growing inside and crystals forming. Use the priming syringe to gently suck out any solution.
3. We don't guarantee use of the **MPRE8** with pressure. eg. Don't force fluid through it at high pressure using a syringe. Apply only enough pressure to pass solution through the tubing.
4. Keep fluid off the outside of the **MPRE8 especially** near the electrical connector.
5. Do not overheat the **MPRE8**. Limit the input voltage to 6V (ie. approx. 3W). **DO NOT** use without feedback control.
6. The mixing tip is interchangeable so you can order spare tips or have one made to better suit your experiments.
7. Make sure you close off unused inlets or solution will flow back through the unused tubes. **Also some researchers have suggested filling the unused tubes with control solution to minimize contamination by test drugs in tubes being used.**
8. Remember that if you **reduce the diameter of the outlet tube** you will create **backpressure** and increase the likelihood of solution being pushed back and contaminating the other tubes.
9. We have provided a thin Teflon cover to protect the mixing tip. Make sure that you slide this off carefully by sliding down the Delrin sleeve so that you don't disturb the mixing tip.
10. The 0.25" OD slit sleeve allows you to use the **MPRE8** in a holder for electrodes.



Mixing tip removal/replacement

The **MPRE8** tip is made using a fine polyimide capillary. The tube can eventually fatigue and break so try not to stress the capillary. You can purchase replacement tips in packs of 5 from us. When you need to replace the mixing tip it can be removed by twisting it and carefully pulling it away from the pre-heater body. Clean off any silicon glue from the outside of the tubes and the sealing sleeve at the tip (use a dissecting microscope). Clean out any glue from the inside of the the mixing tip using long fine forceps. Then dampen some paper towel or tissue with rubbing alcohol and make into a spike and insert in the tip. Press into tip with forceps and rotate to clean the inside of the tip.

To refit a new mixing tip put a thin layer of the glue (use a dissecting microscope) on the 1mm long polyimide sealing ring (**B**) surrounding the capillaries making sure **NONE** gets on the very end where the open tubes are located. Push the mixing tip onto the pre-heater so that it goes on as far as possible. The tip of the pre-heater subassembly should end up at the start of the conical section as in the illustration. Some silicon glue should come out at the junction between the mixing tip and the barrel of the pre-heater.

If the tubes get blocked with dried solution or glue you can assist clearing the blockage with a fine stainless steel wire threaded from the inlet end (0.009" diam Small Parts SWGX-90). To do this you should remove the mixing tip. When you thread the wire through the inlet tube you may need to rotate it so that it goes into the smaller capillary that runs inside the pre-heater.

MPRE8 Specifications

DIMS. 10 x 0.4cm (LxDiam), adapter for 0.25" for electrode holder; heater resistance ≈11Ω
THERMISTOR SENSOR: 10kΩ NTC
PLUGS into HEATER Aux or **TC2-Ch3** (with adapter cable) of **TC2BIP.**
DEAD SPACE: Tubes-approx 5µl; Tip-approx. 1-2µl.
INFLOW TUBE: OD. 0.7mm. Connects to 0.02 ID, 0.06" ID microbore Tygon tubing or Cole-Parmer 1/50"ID 1/12"OD silicon tubing (#06411-59)
OUTFLOW TUBE: 360µm ID polyimide. Replacement capillaries are available. Also rigid fused silica capillaries can be used. Please call us if you need replacements.