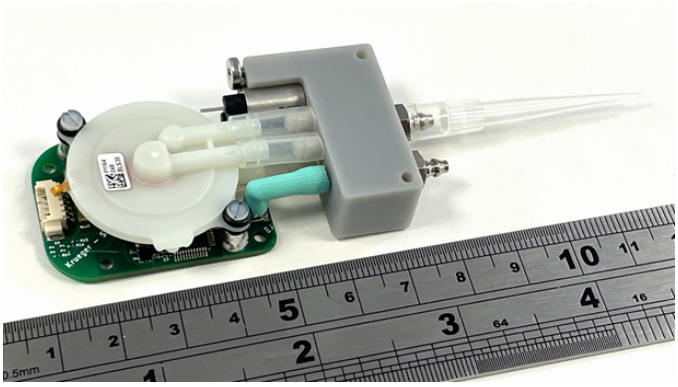
ttpventus
Performance. Precision.

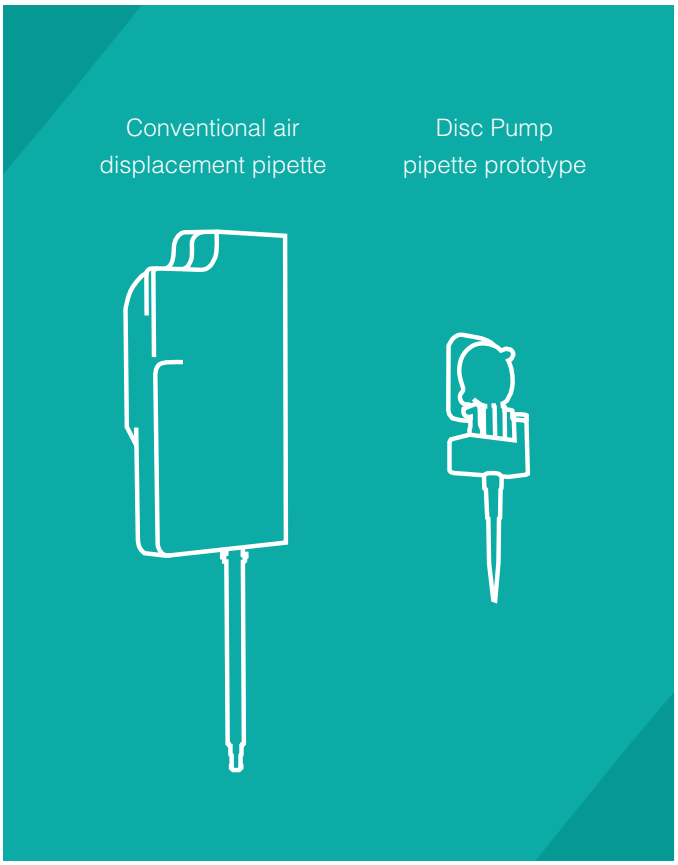
APPLICATION NOTE

AN049: DISC PUMP PIPETTING CONCEPT



Above: prototype design for a Disc Pump pipetting module. Below: comparison in size with conventional pipetting module

WATCH VIDEO DEMONSTRATION



Introduction

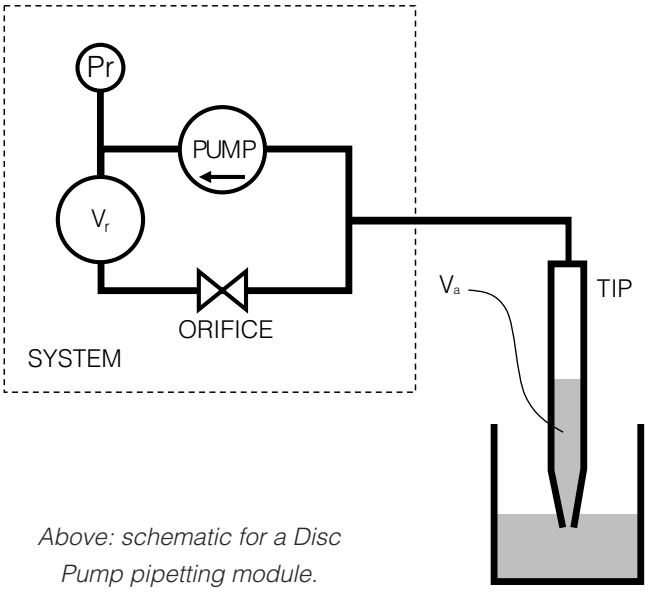
TTP Ventus has developed a concept for an air displacement pipetting module enabled by our high-performance piezoelectric micropump, Disc Pump. This concept can enable devices that are smaller, lighter and lower cost than conventional air displacement systems.

This application note describes a simple system architecture that enables the pump to be used in an air displacement regime, exploiting the high-precision pressure control and pulsation-free output of the pump to deliver exceptional performance. This scheme also enables aspiration and dispensing without the need for additional valving to reverse the flow.

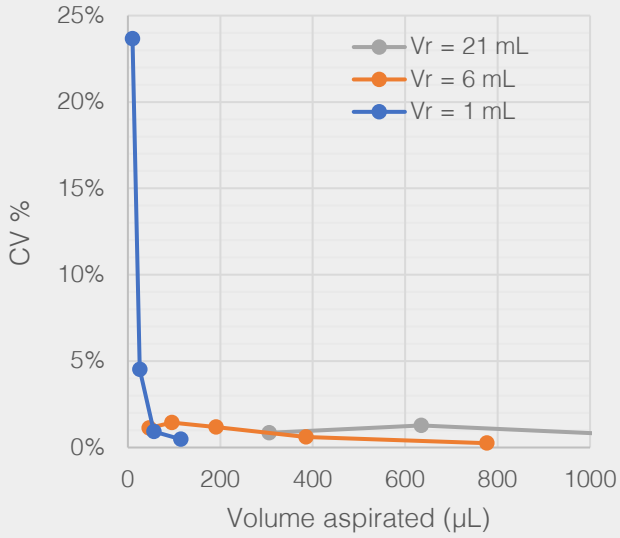
Contact TTP Ventus to speak to one of our experts about implementing this scheme in your next product.

Benefits

- Compact and lightweight
- Low cost
- Precise and accurate
- Wide dynamic range
- Millisecond response speed



Above: schematic for a Disc Pump pipetting module.



Above: repeatability data for aspirated volume for three reservoir volume sizes, demonstrating CV of ~1% or better over much of the measurement range.

How it works

The system architecture includes the pump, an orifice (flow restrictor), a pressure sensor (Pr) and a reservoir volume (V_r), connected to a pipette tip.

Step 1: With the tip above the fluid, the pump is turned on. The flow restriction created by the orifice causes the pressure in V_r to rise. The pump drive power is controlled so that a target pressure of P_1 is reached in V_r. This elevated pressure provides an excess of stored air to ensure full and complete dispensing in step 5.

Step 2: The pipette tip is lowered into the fluid.

Step 3: The pump drive power is increased so that a higher target pressure, P_2, is reached in V_r. An additional discrete quantity of air, proportionate to (P_2-P_1), is displaced from the tip into the system. The air pressure in the tip reduces, drawing fluid into the tip. The exceptional pressure regulation offered by Disc Pump in turn provides high-precision control over the quantity of fluid aspirated, V_a.

Step 4: The pipette tip is withdrawn from the fluid.

Step 5: The pump power is reduced. The pressure in V_r discharges through the orifice into the tip. This results in fluid dispense from the tip. Dispense speed is controlled by the rate that the pump power (and therefore the pressure in V_r) is reduced - turning the pump off completely will result in the fastest dispense speed.