

HSPC-1, High Speed Pressure Clamp

If you study mechanosensitive channels, then you need ALA's **High Speed Pressure Clamp, HSPC-1**. The **HSPC-1** is the only commercial instrument that can generate reproducible and rapid pressure/vacuum steps. Adding the **HSPC-1** and the **PV-Pump** accessory to any patch clamp rig creates a complete system for biophysical studies in this emerging area.

HSPC-1 System features include:

- * Pressure and vacuum partitioned by small headstage that easily mounts near amplifier probe
- * Simple connection to electrode holder transmits pressure/vacuum pulses
- * Command input of 20mV/mmHg sets pressure
- * Pressure read via 20mV/mmHg signal monitor or from LED display
- * Moisture sensor prolongs life of headstage
- * Compatible with all major patch clamp hardware/software
- * Improves consistency of establishing gigaseals and whole-cell configuration
- * Based on design of Besch et. al.¹



Typical pipette holder connection to HSPC-1 headstage

HSPC-1 Specifications:

max. input pressure/vacuum: +/-7psi/362mmHg
standard output pressure/vacuum range: +/-200mmHg
noise: +/- 10mV/ +/-1mmHg
power: 110/220VAC .5A Slow Blow
weight/dimensions controller: 2.9lbs/1.32kg - 8.5"/21.6cmx7.5"/19cmx4"/10cm
weight/dimensions headstage: 0.5lbs/0.23kg - 3.75"/9.5cmx1.75"/4.4cmx1.75"/4.4cm
typical speed of response: 0 to 100mmHg jump in 10ms: 0 to 100% settling time
command input: 20mV/mmHg
monitor output: 20mV/mmHg
set point control = holding pressure/vacuum offset control: +/-200mmHg
water alarm: optical liquid detection sensor to protect valve
specifications are subject to change without notice

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The **HSPC-1** is an easy-to-use device for generating arbitrary pressure waveforms for the study of mechanosensitive ion channels during patch clamp recording. The **HSPC-1** receives dialed in pressure/voltage commands or follows a command voltage waveform generated by any major commercial electrophysiology data acquisition/experimental control system. The headstage contains a piezoelectric valve that partitions pressure and vacuum from a source and a pressure sensor for feedback control and display of internal pressure or vacuum. The headstage is small and light enough to mount on the microscope stage near the patch clamp headstage, without getting in the way during manual manipulations. The system is sensitive and reliable enough not only to generate the responses required for the study of channel gating, but also to generate automated pressure/vacuum pulses for establishing giga-seals, or the whole-cell configuration, with improved consistency.

PV-Pump System

The **PV-Pump System** is the ideal pressure/vacuum source for the **HSPC-1 High Speed Pressure Clamp**. It provides balanced pressure and vacuum to the **HSPC** headstage. The system includes separate power switches for each pump and separate gauges for monitoring the pressure and vacuum outputs. The supporting platform under the pumps contain two internal chambers that dampen oscillations from the pumps to the electrode holder. Emergency release valves on the side of the rail are also incorporated into the **PV-Pump** and open when the pressure or vacuum go beyond the factory set limits. The pumps are specific for 110/220 VAC operation. The outputs are set to +/- 7psi/362mmHg.



References:

Besch, S.R., Suchyna, T., and Sachs, F. (2002). High-speed pressure clamp. *Pflügers Arch.* 445, 161-166.
Suchyna, T., Besch, S.R., and Sachs, F. (2004). Dynamic regulation of mechanosensitive channels: capacitance used to monitor patch tension in real time. *Phys. Biol.* 1, 1-18.
Hypoosmotic- and pressure-induced membrane stretch activate TRPC5 channels. *J Physiol.* Viana, F. (2008)
Effects of GsMTx4 on Bacterial Mechanosensitive Channels in Inside-Out Patches from Giant Spheroplasts. *Biophysical.* Sukharev, S. (2010)
Piezo proteins are pore-forming subunits of mechanically activated channels. *Nature.* Patapoutian, A. (2012)

Ordering Information

HSPC-1	includes controller, piezo valve headstage and cable, misc. tubing, and fittings
PV-Pump	Pressure / vacuum pumps with output tubing
Tubing-2	replacement PV-Pump tubing 1/16"/1.57mm ID PVC - 10'
Tubing-5	silicone replacement headstage tubing - 10'
SFK	small fittings and luer kit