

OC-725D Oocyte Voltage Clamp

Designed for Two-electrode whole-cell voltage clamping of *Xenopus* oocytes



The OC-725D Oocyte Clamp is designed for two-electrode, whole-cell voltage clamping of *Xenopus* oocytes. The dedicated design of the OC-725D includes such features as high compliance voltage (± 180 V) and unique bath clamp circuitry. These same features also make the OC-725D ideal for clamping other large cells and cell structures such as squid axons. Improvements to this version include a 4-pole Bessel filter on the Monitor output with a range of 50Hz to 10KHz or full bandwidth. The electronics have been redesigned to improve energy efficiency and reliability.

Fast Stable Voltage Clamping

The OC-725D combines high AC and DC gains and a voltage compliance of ± 180 volts to insure fast, nonsaturating clamp performance under nearly any condition. The AC clamp gain is variable up to 2000. An additional DC gain of 1×10^6 may be employed for high conductance cells (leaky oocytes).

Two clamp speeds are available: The Slow mode is used for screening oocytes or for applications not requiring fast response times. The Fast mode is used for accurate voltage clamp of fast whole cell currents. Clamp response time in the Fast mode is 550 μ sec (10-90% rise time) when applying a 100 mV step to the included model cell*.

Improved Bath Clamp Headstage

The current measuring range of the OC-725D bath clamp headstage has been extended at both ends by the addition of a 3 position range multiplier. Smaller currents are amplified to usable levels and larger currents up to 1 mA can be recorded without output saturation. The unique design of the bath clamp eliminates the need for series resistance compensation. It provides an accurate measurement of bath current by creating a virtual ground in the bath while simultaneously clamping the bath potential at zero.

Voltage Headstage Probe

The voltage measuring headstage is a single-ended, high-impedance probe. Its small size, convenient mounting rod and 2 meter cable make for easy attachment to a micropositioner. The headstage input is a 2 mm diameter pin. An electrode holder with a 2 mm jack (supplied) mounts directly on the headstage.

Voltage & Current Meters

Independent meters provide simultaneous displays of membrane voltage V_m and membrane current I_m . To assure proper impalement of the current electrode, the current meter displays membrane potential V_e from the current electrode before the clamp circuit is turned on.

Clamp Commands

The internal Hold control is a ten turn potentiometer with two ranges; ± 0 to 100 mV ($\times 10$) and ± 0 to 200 mV ($\times 20$). External command signals applied to Command IN $\div 10$ are attenuated to reduce noise from the command source. Hold and external commands are summed.

Additional Features

- Buzz controls (1 kHz square wave) for each electrode aid in penetration of cell membranes with a minimum of leakage.
- Overload alarm (audible and visual) indicate when the compliance voltage is exceeded safeguarding the oocyte and indicating that current records are subject to saturation.
- DC Offsets for both voltage and current electrodes.
- Electrode Test for both electrodes.

*Model cell: $1M\Omega$ in parallel with 500nF, $1M\Omega$ current and voltage electrodes.

OC-725D Oocyte Voltage Clamp

Electrode Holders

Two vented electrode holders with silver wires are typically required with the clamp; a straight type for use with the voltage headstage and a 45° type with mounting handle for use with current electrodes. Vents have been added to the electrodes to prevent pressure build-up inside the electrode which can damage oocytes. A two meter length cable assembly is provided to connect the current electrode holder to the clamp.

Specifications

Test Conditions

1. Model cell used to obtain specifications: model membrane, 1 M Ω in parallel with 550 nF, 1 M Ω current and voltage electrodes.

2. Noise measurements made with an 8-pole Bessel filter.

Voltage Recording Channel (Vm):

V Probe Input Impedance	0.5 x 10 ¹² Ω , 1 pF
Output Resistance	100 Ω
DC Offset	\pm 200 mV at input, var. from zero with 10 turn control, (20 mV/turn)
Noise (0-10 kHz)	3 μ V RMS with input grounded 20 μ V RMS with model cell
Electrode Test	10 mV/M Ω read on meter 100 mV/M Ω at Vm x10 output
Meter Range	\pm 199.9 mV full scale
Current Sensing (Bath Clamp) Channel (Im):	
Noise (0-1 kHz)	4.5 nA RMS with bath clamp 10 nA RMS in output leg
I Monitor Output	1 nA/mV to 1 mA/10V in 7 steps and 3 ranges, x0.1, x1, and x10
Gain Telegraph Output	0.2 to 2.8 V in 8 steps (200 mV/step) and 3 ranges, x0.1, x1, and x10. Compatible with data acquisition software
Meter Range, Full Scale	Clamp Current: \pm 199.9 μ A
Electrode Voltage	Ve \pm 199.9 mV (Current meter reads Ve when clamp mode switch is off)
Current Electrode Channel:	
Compliance Voltage	\pm 180 V
Clamp Speed	550 μ sec. (10-90%) with 100 mV square wave command applied to model cell
Gain	Variable AC/DC: 0 to 2000
Fixed DC Gain	Switch selected: 1 x 10 ⁶
Ve DC Offset	\pm 200 mV at input (20 mV/turn)
Electrode Test	10 mV/M Ω read on current meter 100 mV/M Ω at Ve x10 output, front and rear panels

Specifications (continued)

Commands:

Hold	Manually set with ten turn potentiometer and 2 ranges: x10 range: 0 to \pm 100 mV x20 range: 0 to \pm 200 mV
External	Signals applied to COMMAND IN-10 are attenuated by a factor of 10, 1 V applied = 100 mV command
Power Requirements	100-130 V or 220-240 VAC, 50/60 Hz, 14 VA
Physical Dimensions:	
Case	8.9 cm H x 43.2 cm W x 30.5 cm D
Voltage Headstage	12.5 mm D x 5 cm L with 1.8 m cable
Mounting Handle	8.0 mm D x 6.3 cm L
Bath Headstage	2.3 cm H x 2.9 cm W x 4.2 cm L with 1.8 m cable
Shipping Weight	6.0 kg
Warranty	One year, parts & labor

Order # Model Product

64-3068	OC-725D	Oocyte Voltage Clamp Amplifier supplied with voltage headstage, bath clamp, current cable, model membrane, and rack mount hardware. Order one straight holder and one 45° holder purchased separately.
----------------	----------------	---

Accessories and replacement parts

64-3069		Replacement voltage headstage
64-3070		Replacement bath clamp
64-0033		Replacement Current Electrode Cable
64-0029		Replacement Model Cell

For use with OC-725D Voltage Probe

64-1007	ESW-F10V	Stright Holder 1.0 mm glass O.D.
64-1008	ESW-F12V	Stright Holder 1.2 mm glass O.D.
64-1009	ESW-F15V	Stright Holder 1.5 mm glass O.D.
64-1010	ESW-F20V	Stright Holder 2.0 mm glass O.D.

For use with OC-725D Current Electrode

64-1051	E45W-F10VH	Stright Holder 1.0 mm glass O.D.
64-1052	E45W-F12VH	Stright Holder 1.2 mm glass O.D.
64-1053	E45W-F15VH	Stright Holder 1.5 mm glass O.D.
64-1054	E45W-F20VH	Stright Holder 2.0 mm glass O.D.