

made to measure

MVCS Series Iontophoresis Amplifiers



Ref.: Liu et al. (1999). Neuron, 22:395–409
Murnick et al. (2002). J Neurosci.Meth. 116: 65-75
Kovalschuk et al. (2015). Nat Commun. 6:6349
Müller et al.,(2013). J. Vis. Exp. 77: e50701,
Heine et al. (2008). Science 320:201-205
Castilho et al. (2015). J Neurosci. 35: 5422–5433
Jacob et al. (2013). J. Neurosci.33: 13724 –13734

Iontophoresis involves the ejection of drugs or other ionic compounds through micropipettes by the application of current. Depending on the net charge of the substance to be ejected positive or negative current is applied to the micropipette to cause the ions to flow. npi electronic has designed very accurate current pumps to perform iontophoresis ejection of ionic substances. npi MVCS systems are high-voltage, high-speed current sources for iontophoresis or other applications, where constant currents in the nA or μ A range are needed. Some models allow very fast drug applications down to the sub-millisecond range. Therefore, these systems can be used to simulate synaptic events. The unique operating and display elements of the instruments facilitate the application of drugs in physiological, pharmacological, and biochemical studies. The standard version is designed for relatively slow drug applications in the range above 100 milliseconds. With these models the microelectrode is connected via a special cable directly to the front panel of the instrument. The fast version with high-speed capacity compensation is suitable for drug application in the sub-millisecond range. This version includes a special small headstage for each channel as well as an electrode resistance test circuit.

Features:

- ⇒ One or two channel versions (one channel versions can be upgraded)
- ⇒ Time resolution: down to **100 μ s**, spatial resolution: down to **1 μ m**
- ⇒ Simulation of synaptic events, suitable for receptor density mapping
- ⇒ Automated balancing of iontophoretic current (option)
- ⇒ Currents from tens of pA up to μ A
- ⇒ High-voltage, high-speed current source
- ⇒ Automated electrode resistance test
- ⇒ Also available as module for the EPMS-07 system



Headstage of MVCS



Technical Data

Electrode Output:

floating current source
 output impedance $> 10^{12} \text{ } \Omega$

Maximum Current:

$\pm 450 \text{ nA}$ [$\pm 1.5 \text{ } \mu\text{A}$] into $100 \text{ M}\Omega$ load

Display:

current: XXXX nA, balance: XX.XX μA ,
 voltage: XXX.X V, R_{EL} : XXXX M, displayed
 value is set by a three position toggle switch,
 separate displays for each channel

Eject:

ten-turn control, range: $\pm 100 \text{ nA}$ resp. $\pm 1 \text{ } \mu\text{A}$,
 selected by switch

Minimum pulse duration:

$100 \text{ } \mu\text{s}$

Retain:

ten-turn control, maximum $\pm 100 \text{ nA}$

Capacity compensation:

ten-turn control, range 0-30 pF

Output current polarity:

selected by INVERTED/NORMAL toggle switch

TTL input (AUTO mode):

LO = RETAIN, HI = EJECT, $R_{\text{in}} > 5 \text{ k}\Omega$

Modes of operation:

set by two toggle switches
 EJECT/RETAIN/AUTO switch enables manual or TTL
 controlled operation
 SET/OPERATE switch connects automatically electrode
 outputs to ground (SET position)

Analog input:

sensitivity $100 \text{ nA} / \text{V}$, $R_{\text{in}} > 100 \text{ k}\Omega$ range $\pm 10 \text{ V}$

Current monitor:

sensitivity $100 \text{ nA} / \text{V}$, $R_{\text{out}} = 50 \text{ } \Omega$

Voltage monitor:

$V_{\text{EL}} / 10$, $R_{\text{out}} = 50 \text{ } \Omega$

Balance output:

inverted sum of all injection currents, sensitivity $1 \text{ } \mu\text{A} / \text{V}$

Power requirements:

$230 \text{ V} / 115 \text{ V}$, $50 \text{ Hz} / 60 \text{ Hz}$ AC, 50 W , fuse $0.4 \text{ A} / 0.8 \text{ A}$, slow

Dimensions:

19" rackmount cabinet, 19" (483 mm), 10" (250 mm), 3.5" (88 mm)
 Headstage: $65 \times 25 \times 25 \text{ mm}$

The various configurations of MVCS systems are reflected in the part number

MVCX-C-0YA-V

where

X: S = Iontophoresis System C = Balance channel (Module only)

C: Fast System with Headstage(s)

Y: Number of Channels (1 or 2)

A: C = Iontophoresis System with Balance U = Upgrade M = Module

V: max. Voltage (45 V or 150 V)

Examples

MVCS-01C-45

19" instruments, one application channel, one balance channel,
 slow ($> 100 \text{ ms}$), 45 V

MVCS-C-02M-150

Module for EPMS-07 system, two application channels, fast ($< 1 \text{ ms}$), 150 V



MVCS Series

19" Stand Alone Systems

*Standard (Slow, > 100 ms
without headstage)*

*Fast (< 1 ms, with cap.comp.
and headstage)*

One channel
(without balance)

MVCS-01-45
45 V

MVCS-01-150
150 V

MVCS-C-01-45
45 V

MVCS-C-01-150
150 V

One channel
(with balance)

MVCS-01C-45
45 V

MVCS-01C-150
150 V

MVCS-C-01C-45
45 V

MVCS-C-01C-150
150 V

Upgrade to
second channel

MVCS-01U-45
45 V

MVCS-01U-150
150 V

MVCS-C-01U-45
45 V

MVCS-C-01U-150
150 V

Upgrade to
balance

MVCC-U-45
45 V

MVCC-U-150
150 V

MVCC-C-U-45
45 V

MVCC-C-U-150
150 V

Two channels
(without balance)

MVCS-02-45
45 V

MVCS-02-150
150 V

MVCS-C-02-45
45 V

MVCS-C-02-150
150 V

Two channels
(with balance)

MVCS-02C-45
45 V

MVCS-02C-150
150 V

MVCS-C-02C-45
45 V

MVCS-C-02C-150
150 V

Modules for EPMS-07 System

*Standard (Slow, > 100 ms
without headstage)*

*Fast (< 1 ms, with cap.comp.
and headstage)*

One channel

MVCS-01M-45
45 V

MVCS-01M-150
150 V

MVCS-C-01M-45
45 V

MVCS-C-01M-150
150 V

Two channels

MVCS-02M-45
45 V

MVCS-02M-150
150 V

MVCS-C-02M-45
45 V

MVCS-C-02M-150
150 V

Balance module

MVCC-M-45
45 V

MVCC-M-150
150 V

MVCC-C-M-45
45 V

MVCC-C-M-150
150 V

Standard systems come with a set of cables to connect the electrode directly to the 8-pole connector at the front panel

Fast systems come with a headstage with BNC connector, capacity compensation and an automated electrode resistance test



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Examples

Examples

MVCS Series

MVCS-C-02C, two channels, fast, with balance channel
(headstages not shown)



MVCS-02C, two channels, slow, with balance channel



MVCS-C-02M, iontophoresis module,
fast, two channels for EPMS
(headstages not shown)



MVCS-01M, iontophoresis module,
slow, one channel for EPMS



MVCC-M, balance modules for EPMS

fast

slow



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