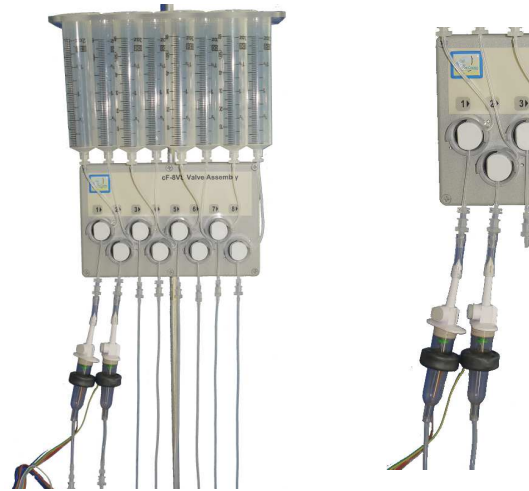


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Equipment for cellular & electrophysiology research

cFlow V2.x 8-Channel Switch/Flow Control System



cF8Vs Set up for switching 6ch & flow 2ch

Drop sensors on Ch1, Ch2

- **cFlow 8 Ch Flow/Switch System versions:**
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CF8PKG H- for **flow (up to 8Ch) and switch (8Ch)**
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- **Rapid pinch valve switching (typ. 50ms)**
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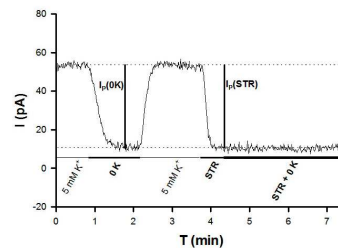
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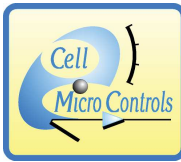
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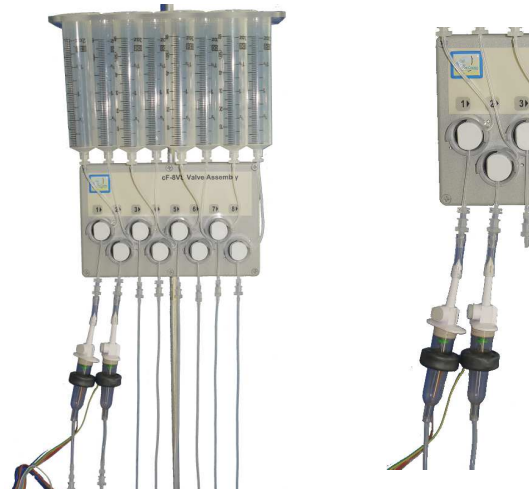
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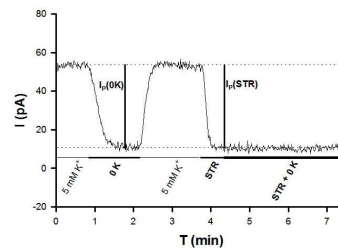
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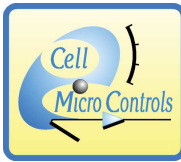
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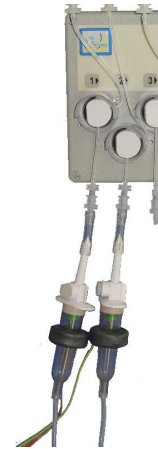


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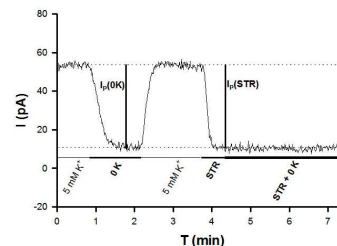
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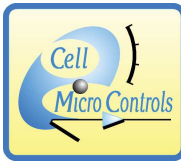
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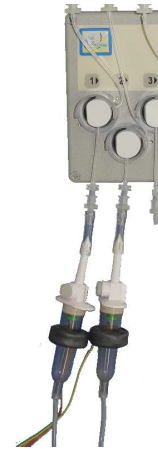


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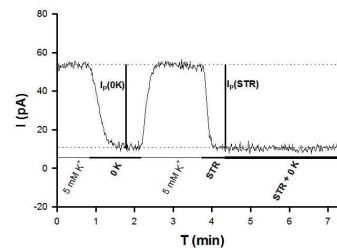
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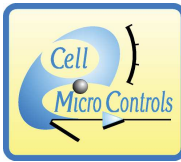
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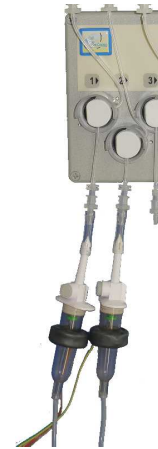


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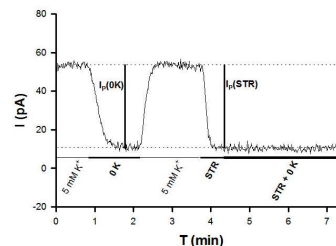
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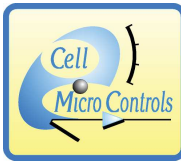
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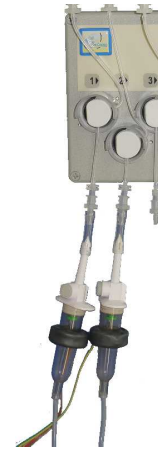


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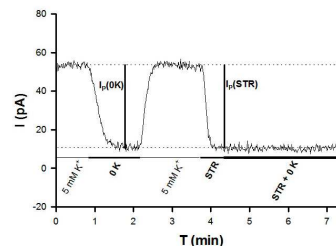
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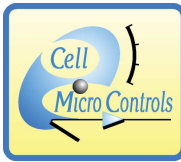
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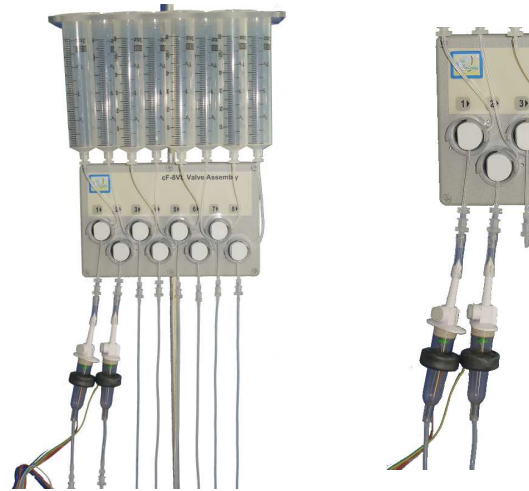
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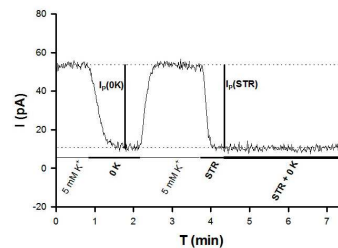
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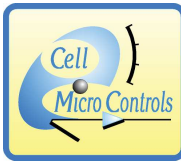
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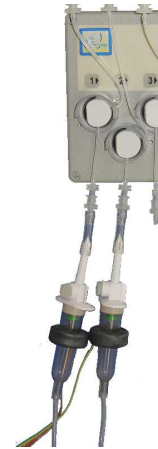


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 WWW: <http://www.cellmc.com>; Email: info@cellmc.com
Equipment for cellular & electrophysiology research

cFlow V2.x 8-Channel Switch/Flow Control System



cF8Vs Set up for switching 6ch & flow 2ch



Drop sensors on Ch1, Ch2

- **cFlow 8 Ch Flow/Switch System versions:**
CFPKG8H - for **switching (8Ch)**
CF4PKG8H- for **flow (up to 4Ch) and switch (8Ch)**
CF8PKG8H- for **flow (up to 8Ch) and switch (8Ch)**
- **8 Channel perfusion control**
- **Rapid pinch valve switching (typ. 50ms)**
- **Simultaneous flow control (0.1-10ml/min)**
- **Detects if solution stops flowing**
- **RS232, Digital (eg. CLAMPEX) & Analog input for computer control**
- **Upgrade microcontroller firmware via RS232 for addition of new features**

DESCRIPTION

In addition to switching solutions the **cFlow** 8 Channel Flow controller can regulate the flow rate on user selected channels using an optical drop sensor that fits around standard dripsets. For example you could have 2 channels for background solutions with flow sensors and the other 6 channels switched via a superfusion device (eg. **MPRE8**) where you only want to switch solutions. One instrument functions as two separate devices. In other modes the flow can be regulated (at different rates) on all 8 channels (eg. to feed multiple chambers).

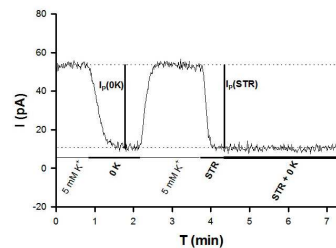
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There is a single Flow rate control so that flow rates can be stored (using the Read Rate switch) and consistently set to the same value. The backlit LCD display shows the channel, flow rate and other useful information depending on the mode of operation.

Application notes

■ Flow control vs switching

The **cFlow** 8 Ch Flow controller has the capability to monitor and control the flow rate in each channel but in many applications only a single or several drop sensors are required. eg. for perfusing a 0.25-1ml chamber you might have flow control of one or several background perfusates but switch the other solutions rapidly via the **MPRE8** pre-heater or other miniature manifold. For these channels the drop sensors are not used. For small volume (eg. <0.1ml) chambers an 8 to 1 manifold (**MAN81**) can be used before the inflow and simple switching used (see figure below).



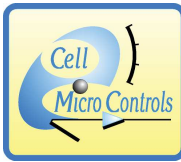
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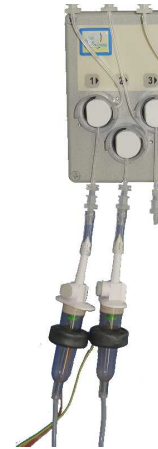


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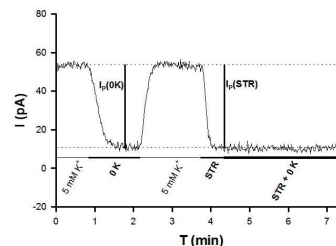
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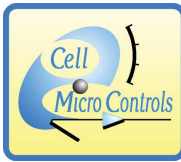
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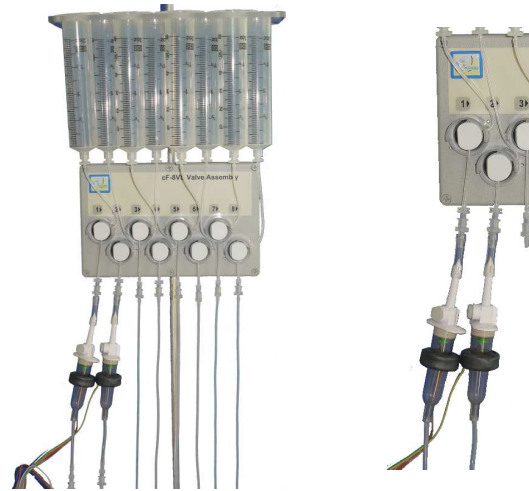
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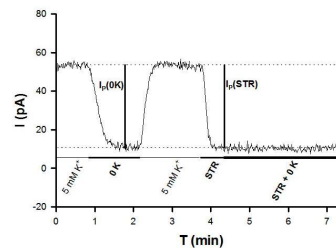
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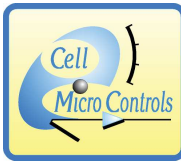
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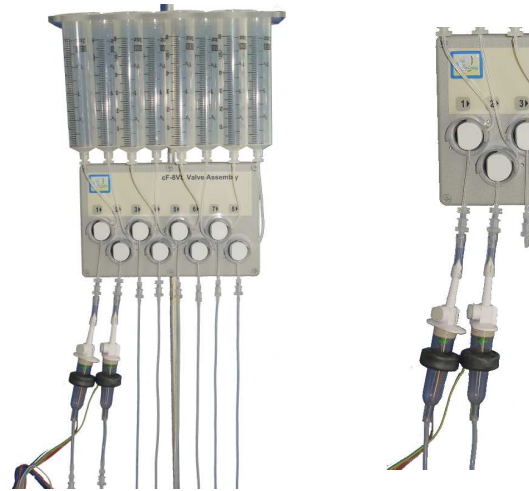
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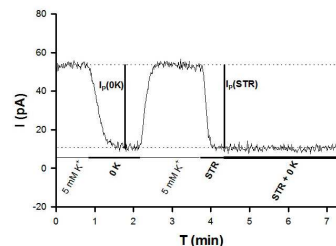
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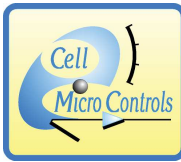
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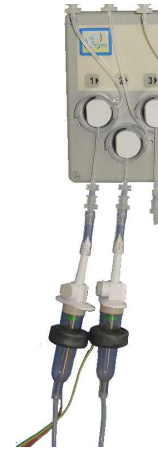


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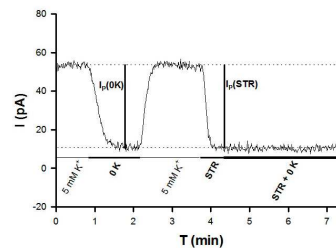
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■ Computer control

There are several automated methods for controlling the **cFlow**. Serial (RS232) allows channel switching to be controlled from any device supporting RS232 communications. An analog input allows a voltage input to switch the channel at precise times (eg. in CLAMPEX). The Digital output from a data acquisition system (eg. Digidata with CLAMPEX) can also be used for control (using cable **CAB10R/BNC**). Alternatively the 5 line Digital IO port can also supply status information to a host to log user control.

■ Upgrading

The **cFlow** is a microcontroller based instrument with built in firmware. It isn't a simple valve driver. Updated firmware can be simply download via the RS232 port to upgrade or customize the performance of the **cFlow** for a particular application.

■ Other valves

The **cFlow** is supplied with pinch valves but other low power 12V valves are also suitable. In the design of the **cFlow** we have allowed for mixing two different types of valves for channels 1-4 and 5-8. Please call if you need advice.

■ Effect of valve on/off on flow

You might think that since the flow control uses an on/off valve then the flow would be pulsatile. In fact the dripset bulb and tubing compliance "buffers" the flow so that when the flow enters the chamber even at a modest flow rate (>0.1ml/min) the flow is smooth. Smaller drippers and also be used for very slow flow rates since the drop sensor (**CF-4SEN**) can detect very small drops. Conversely for higher flow rates (3-10ml/min) a larger dripper is used (eg. 10 or 15dpm dripsets).

System components/Accessories

cF-8VS 8 ch shielded valve assembly

Shielded for use in electrophysiology setups where low noise levels are important. 8 valves are contained in a metal housing. Attaches to 3/8" diameter retort rod. Includes plumbing kit for flow and switch (8 sets).



cF-4SEN drop sensor assembly

The drop sensor fits around the dripset and is used to sense a drop as it passes in an IR beam. The **cF-4SEN** are designed to fit the **IV60D8** IV sets but can be used with other dripsets with an O.D. less than 0.6". Attaches to 3/8" diameter retort rod.



SYRHLD8 Syringe holder

The **SYRHLD8** holds 8 60cc syringe barrels. The holders can be adapted to smaller syringe barrels with collars. Attaches to 3/8" diameter retort rod.



IV60D8 IV infusion sets

These infusion sets (8 pieces) have drippers designed for 60 drops/ml. They can be used with the **cFlow** for flow rates up to 3ml/min.

SYR608 60cc syringes

60cc (8 pieces) are provided with the Flow/switch control systems.

cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

Control modes: Analog control (0-5V), RS232 input and Digital input (4 wire)

Reporting: RS232 output, digital output gives state of channel

Push-button functions: Purge valves, close Bank0, close Bank1, drain valves.

Read rate: Reads rate from potentiometer.

Flow thru: Used to halt flow when fluid runs out to prevent bubble entry.

LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

CAB-I10R/BNC Interface cable

The **CAB-IOR/BNC** cable connects to the I/O port on the rear of the **cFlow**. For CLAMPEX you can use digital input mode and set a bit pattern using 4 lines (see examples on website).

For Analog control you can use I/O line and just connect a single BNC cable.



MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



MPRE8 Multi-tube Pre-heater



For supertusion of cells or small tissue pieces. The **MPRE8** has 8 fine glass tubes which are heated and converge in a very small mixing volume. The temperature is sensed near the solution outflow by a miniature thermistor sensor. Normally the **MPRE8** connects with the **TC2BIP** Bipolar Temperature Controller or **mTCII** 2Ch micro-Temperature controller.

Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

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Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

There are several automated methods for controlling the **cFlow**. Serial (RS232) allows channel switching to be controlled from any device supporting RS232 communications. An analog input allows a voltage input to switch the channel at precise times (eg. in CLAMPEX). The Digital output from a data acquisition system (eg. Digidata with CLAMPEX) can also be used for control (using cable **CAB10R/BNC**). Alternatively the 5 line Digital IO port can also supply status information to a host to log user control.

■ Upgrading

The **cFlow** is a microcontroller based instrument with built in firmware. It isn't a simple valve driver. Updated firmware can be simply download via the RS232 port to upgrade or customize the performance of the **cFlow** for a particular application.

■ Other valves

The **cFlow** is supplied with pinch valves but other low power 12V valves are also suitable. In the design of the **cFlow** we have allowed for mixing two different types of valves for channels 1-4 and 5-8. Please call if you need advice.

■ Effect of valve on/off on flow

You might think that since the flow control uses an on/off valve then the flow would be pulsatile. In fact the dripset bulb and tubing compliance "buffers" the flow so that when the flow enters the chamber even at a modest flow rate (>0.1ml/min) the flow is smooth. Smaller drippers and also be used for very slow flow rates since the drop sensor (**CF-4SEN**) can detect very small drops. Conversely for higher flow rates (3-10ml/min) a larger dripper is used (eg. 10 or 15dpm dripsets).

System components/Accessories

cF-8VS 8 ch shielded valve assembly

Shielded for use in electrophysiology setups where low noise levels are important. 8 valves are contained in a metal housing. Attaches to 3/8" diameter retort rod. Includes plumbing kit for flow and switch (8 sets).



cF-4SEN drop sensor assembly

The drop sensor fits around the dripset and is used to sense a drop as it passes in an IR beam. The **cF-4SEN** are designed to fit the **IV60D8** IV sets but can be used with other dripsets with an O.D. less than 0.6". Attaches to 3/8" diameter retort rod.



SYRHLD8 Syringe holder

The **SYRHLD8** holds 8 60cc syringe barrels. The holders can be adapted to smaller syringe barrels with collars. Attaches to 3/8" diameter retort rod.



IV60D8 IV infusion sets

These infusion sets (8 pieces) have drippers designed for 60 drops/ml. They can be used with the **cFlow** for flow rates up to 3ml/min.

SYR608 60cc syringes

60cc (8 pieces) are provided with the Flow/switch control systems.

cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

Control modes: Analog control (0-5V), RS232 input and Digital input (4 wire)

Reporting: RS232 output, digital output gives state of channel

Push-button functions: Purge valves, close Bank0, close Bank1, drain valves.

Read rate: Reads rate from potentiometer.

Flow thru: Used to halt flow when fluid runs out to prevent bubble entry.

LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

CAB-I10R/BNC Interface cable

The **CAB-IOR/BNC** cable connects to the I/O port on the rear of the **cFlow**. For CLAMPEX you can use digital input mode and set a bit pattern using 4 lines (see examples on website).

For Analog control you can use I/O line and just connect a single BNC cable.



MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



MPRE8 Multi-tube Pre-heater



For supertusion of cells or small tissue pieces. The **MPRE8** has 8 fine glass tubes which are heated and converge in a very small mixing volume. The temperature is sensed near the solution outflow by a miniature thermistor sensor. Normally the **MPRE8** connects with the **TC2BIP** Bipolar Temperature Controller or **mTCII** 2Ch micro-Temperature controller.

Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

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■ Upgrading

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■ Other valves

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System components/Accessories

cF-8VS 8 ch shielded valve assembly

Shielded for use in electrophysiology setups where low noise levels are important. 8 valves are contained in a metal housing. Attaches to 3/8" diameter retort rod. Includes plumbing kit for flow and switch (8 sets).



cF-4SEN drop sensor assembly

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SYR608 60cc syringes

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cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

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Read rate: Reads rate from potentiometer.

Flow thru: Used to halt flow when fluid runs out to prevent bubble entry.

LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

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MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



MPRE8 Multi-tube Pre-heater



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Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

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■ Other valves

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System components/Accessories

cF-8VS 8 ch shielded valve assembly

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cF-4SEN drop sensor assembly

The drop sensor fits around the dripset and is used to sense a drop as it passes in an IR beam. The **cF-4SEN** are designed to fit the **IV60D8** IV sets but can be used with other dripsets with an O.D. less than 0.6". Attaches to 3/8" diameter retort rod.



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SYR608 60cc syringes

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cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

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Read rate: Reads rate from potentiometer.

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LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

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For Analog control you can use I/O line and just connect a single BNC cable.



MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



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Dims. 10 x 0.4cm (LxDiam); heater resistance \approx 11 Ω

Thermistor sensor: 10k Ω NTC

Dead space: Tubes-approx 5 μ l; Tip-approx. 1-2 μ l.

Outflow tube: 360 μ m inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

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■ Upgrading

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■ Other valves

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System components/Accessories

cF-8VS 8 ch shielded valve assembly

Shielded for use in electrophysiology setups where low noise levels are important. 8 valves are contained in a metal housing. Attaches to 3/8" diameter retort rod. Includes plumbing kit for flow and switch (8 sets).



cF-4SEN drop sensor assembly

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SYR608 60cc syringes

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cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

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Read rate: Reads rate from potentiometer.

Flow thru: Used to halt flow when fluid runs out to prevent bubble entry.

LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

CAB-I10R/BNC Interface cable

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MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



MPRE8 Multi-tube Pre-heater



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Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

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LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

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Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

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LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

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MAN81 8 to 1 manifold

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Thermistor sensor: 10kΩ NTC

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System components/Accessories

cF-8VS 8 ch shielded valve assembly

Shielded for use in electrophysiology setups where low noise levels are important. 8 valves are contained in a metal housing. Attaches to 3/8" diameter retort rod. Includes plumbing kit for flow and switch (8 sets).



cF-4SEN drop sensor assembly

The drop sensor fits around the dripset and is used to sense a drop as it passes in an IR beam. The **cF-4SEN** are designed to fit the **IV60D8** IV sets but can be used with other dripsets with an O.D. less than 0.6". Attaches to 3/8" diameter retort rod.



SYRHLD8 Syringe holder

The **SYRHLD8** holds 8 60cc syringe barrels. The holders can be adapted to smaller syringe barrels with collars. Attaches to 3/8" diameter retort rod.



IV60D8 IV infusion sets

These infusion sets (8 pieces) have drippers designed for 60 drops/ml. They can be used with the **cFlow** for flow rates up to 3ml/min.

SYR608 60cc syringes

60cc (8 pieces) are provided with the Flow/switch control systems.

cFlow Specifications and Controls

Flow rate range: 60/15 drop/ml dripset => 0 - 3/0-10 ml/min
60 drop/ml dripset will give smoother flow at low flow rates.

Drop sensor: infra-red source/detector

Valve control modes: a) 1 of 8 valves b) 1 of 1-4, 1 of 5-8 c) 1 of 1-6 1 of 7-8 d) n of 8

Control modes: Analog control (0-5V), RS232 input and Digital input (4 wire)

Reporting: RS232 output, digital output gives state of channel

Push-button functions: Purge valves, close Bank0, close Bank1, drain valves.

Read rate: Reads rate from potentiometer.

Flow thru: Used to halt flow when fluid runs out to prevent bubble entry.

LCD display: Displays channel/rate depending on mode.

Supply Voltage: 24V at 1.1A max. Typ. 100mA per valve open.

Dimensions (controller): 6.5 x 5.0 x 2.7 inches (LxWxH)

Optional accessories

CAB-I10R/BNC Interface cable

The **CAB-IOR/BNC** cable connects to the I/O port on the rear of the **cFlow**. For CLAMPEX you can use digital input mode and set a bit pattern using 4 lines (see examples on website).

For Analog control you can use I/O line and just connect a single BNC cable.



MAN81 8 to 1 manifold

For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



MPRE8 Multi-tube Pre-heater



For supertusion of cells or small tissue pieces. The **MPRE8** has 8 fine glass tubes which are heated and converge in a very small mixing volume. The temperature is sensed near the solution outflow by a miniature thermistor sensor. Normally the **MPRE8** connects with the **TC2BIP** Bipolar Temperature Controller or **mTCII** 2Ch micro-Temperature controller.

Dims. 10 x 0.4cm (LxDiam); heater resistance ≈11Ω

Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

Outflow tube: 360µm inside diameter

Inflow tubes: Tube outside diam. 0.7mm. Connects to 0.06" OD, 0.02" ID Tygon tubing.

■ Computer control

There are several automated methods for controlling the **cFlow**. Serial (RS232) allows channel switching to be controlled from any device supporting RS232 communications. An analog input allows a voltage input to switch the channel at precise times (eg. in CLAMPEX). The Digital output from a data acquisition system (eg. Digidata with CLAMPEX) can also be used for control (using cable **CAB10R/BNC**). Alternatively the 5 line Digital IO port can also supply status information to a host to log user control.

■ Upgrading

The **cFlow** is a microcontroller based instrument with built in firmware. It isn't a simple valve driver. Updated firmware can be simply download via the RS232 port to upgrade or customize the performance of the **cFlow** for a particular application.

■ Other valves

The **cFlow** is supplied with pinch valves but other low power 12V valves are also suitable. In the design of the **cFlow** we have allowed for mixing two different types of valves for channels 1-4 and 5-8. Please call if you need advice.

■ Effect of valve on/off on flow

You might think that since the flow control uses an on/off valve then the flow would be pulsatile. In fact the dripset bulb and tubing compliance "buffers" the flow so that when the flow enters the chamber even at a modest flow rate (>0.1ml/min) the flow is smooth. Smaller drippers and also be used for very slow flow rates since the drop sensor (**CF-4SEN**) can detect very small drops. Conversely for higher flow rates (3-10ml/min) a larger dripper is used (eg. 10 or 15dpm dripsets).

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For merging solutions before entering a chamber (flow <5ml/min). Easy to clean with polyimide inlet and outlet suiting 1/32" ID silicon tubing. Dead volume approx 5µl.



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Thermistor sensor: 10kΩ NTC

Dead space: Tubes-approx 5µl; Tip-approx. 1-2µl.

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