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DATA SHEET LS Basic Micropump

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Like other Osmotex micropumps, this product has the advantage of small size, high performance and low power. Being the simplest version offered, it does not include provisions for suppressing bubble-formation and electrolysis. It requires an open inlet reservoir, and will also leave gas bubbles in the flow path under typical circumstances (low voltage pumping of ethanol can be an exception). It can be used with DI water, a range of buffers and ionic solutions as well as with some alcohols.

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Ordering Information

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General

Osmotex' electroosmotic (EO) pumps have the following advantages:

- Very compact disc-shaped design, typical dimensions Ø15mm, thickness 2-4mm
- Do not create gas bubbles in flow path given a certain counter pressure (some versions)
- Reduced influence of electrochemistry
- Low power
- Silent
- Low cost, suitable for volume applications

Osmotex develops advanced EO pumps with strongly reduced influence of electrochemistry and bubble formation, when used in the correct way. Electrochemical reactions should still be considered when considering new liquids.

While Osmotex' standard products cover a wide range of power, flow rates, liquids and other conditions, Osmotex can also develop customized solutions when needed.

Standard pumps are delivered un-calibrated. Like for other EO pumps, the flow – pressure – voltage characteristics depends on the liquid used. Osmotex also offers robust solutions with flow-sensor feedback control.

Typical Performance – LS Basic Micropump

Operating voltage	0 – 15 V
Flow rate	ca 10 - 150 µl/min
Pressure	up to at least 10 PSI (0.7 bar)

Power consumption: from a few mW up to a few 100 mW (varies across the wide range of performance settings and liquids). Note that flow rate and pressures are liquid dependent for electroosmotic pumps.
Flow direction: towards negative electrode.

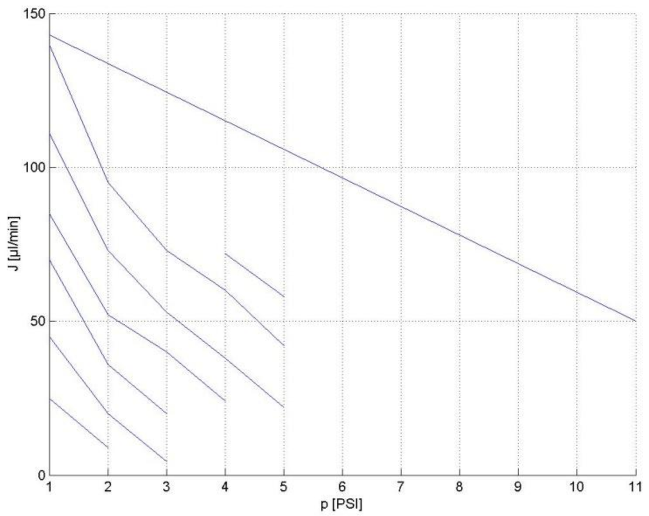

Figure 1: Typical flow-pressure characteristics, curves for 5, 6, 7, 8, 9, 10, 11 and 15 V DC from left to right (fluid: DI water).

Package and Measures

Shape: Circular disc
Diameter: 14 mm
Thickness: 1.8 mm

Despite different characteristics, all Osmotex micropumps are embedded in the same type compact plastic package. These “Pump Cores” (figure 2) do not include fluidic and electric connectors, but can be interfaced with various lab-chips, connectors and other equipment.

Osmotex also offers an evaluation package with fluidic and electric connectors (see Appendix).

Figure 2: **Osmotex micropump "Core". The liquid flow generated is perpendicular to the clover-shaped area in the disc center.**

Geometry and Interfacing with Connectors

In the following is included information necessary to design fluidic and electrical connectors. The clover shaped area in the centre must be available for liquid flow, while the area around can be used for sealing. For example, a flat rubber gasket with diameter large enough to encircle the clover can be pressed against the Pump Core.

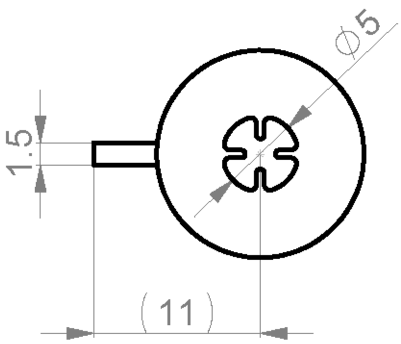

Figure 3: Top/bottom view.

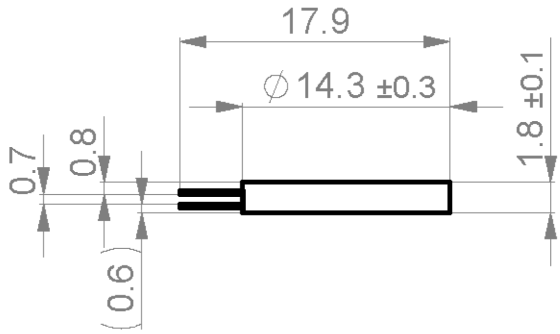

Figure 4: Side view.

Other Diameters

The standard version has electrode diameter 6mm (open flow diameter 5 mm as shown on figure). Osmotex also offer versions with diameters 4 and 8 mm, with maximum flow rates approximately half and double that of the standard version, respectively.

Sealing

The micropump can be interfaced with fluidic connectors using a gasket, for example made of a rubber such as NBR, FKM or (for less deformation) EPDM. It is important that the rubber does not block the gas venting holes and that the gass is allowed to pass to the atmosphere.

Geometry – Future Version with Integrated Electrical Connectors

Osmotex plans to launch a version of the micropump with electric connectors on the top face of the disc shaped Pump Core. This will provide a more compact design without leads sticking out from the periphery. The exact measures of the product might differ from the provisional measures presented in this section.

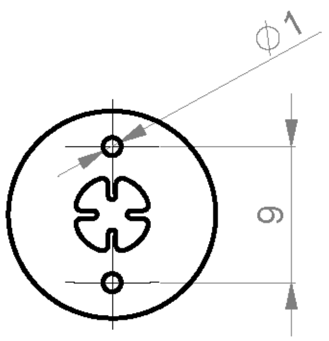

Figure 5: Top view, integrated connectors (provisional measures).

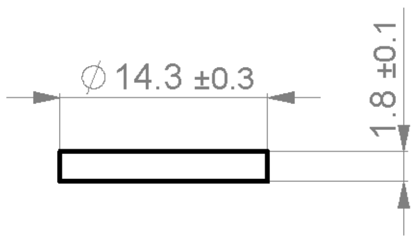

Figure 6: Side view, integrated connectors (provisional measures).

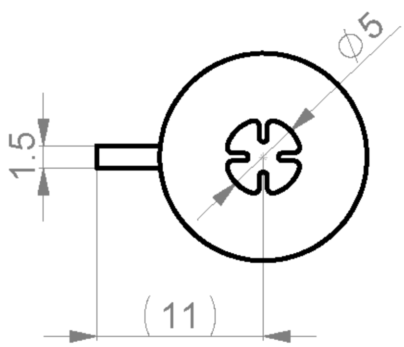

Figure 7: Bottom view, integrated connectors (provisional measures).

Application notes

Filling and Flushing

The pump can be primed by using a syringe while taking care not to inject air to the pump or applying excessive pressure.

To obtain stable flow, there should be a constant water level in the inlet reservoir.

NB Electroosmotic pumps cannot suck air and are not self priming.

Liquids

The LS Basic pump has been tested with DI water, 0.5x TBE buffer, methanol and ethanol. It should be compatible with many other ionic solutions and polar organic fluids, although possible electrochemical reactions should be taken into account.

Precaution

The pump should not be run at higher voltages than 15 V (20V for low conductivity liquids such as ethanol, methanol) and should never be allowed to run dry, as this could lead to breakdown of the electrodes and porous pump structure.

Customized Solutions

Osmotex can engage in application specific development for producers of end user equipment. Our broad expertise in electrokinetics and microfluidics makes us ready to meet most challenges, whether the need is a simple pump with package, a robust design with flow rate feedback control, or the integration of several pumps on a chip.

Osmotex also developed a solution for flow-feedback control for high precision, see figure 8.

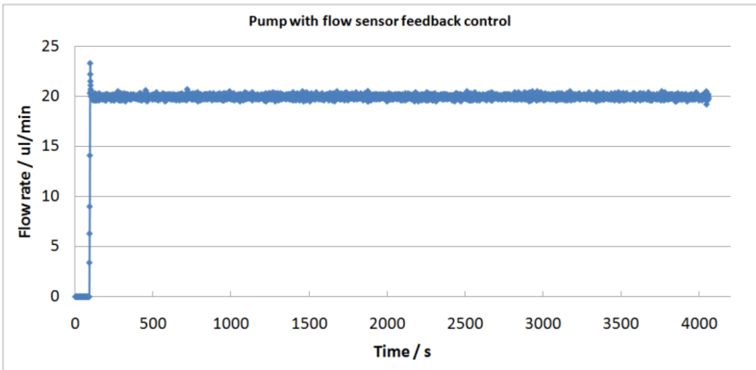

Figure 8: Flow sensor and high precision flow with feedback loop.

Appendix

Auxiliary Equipment

Evaluation Package

Osmotex can deliver the LS Basic micropump embedded in an open reservoir evaluation package with standard fluidic and electrical connectors.

Figure 9: Osmotex open reservoir connector.

Figure 10: Open reservoir connector, bottom view. The fluidic connector has inner diameter 1.7 mm and outer 2.5 mm.

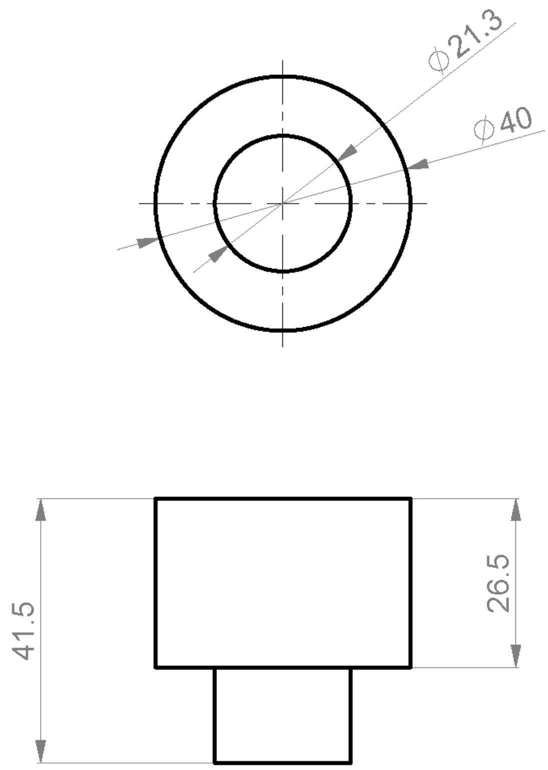

Figure 11: Osmotex' open reservoir connector would fit into a cylinder as shown (top and side views).

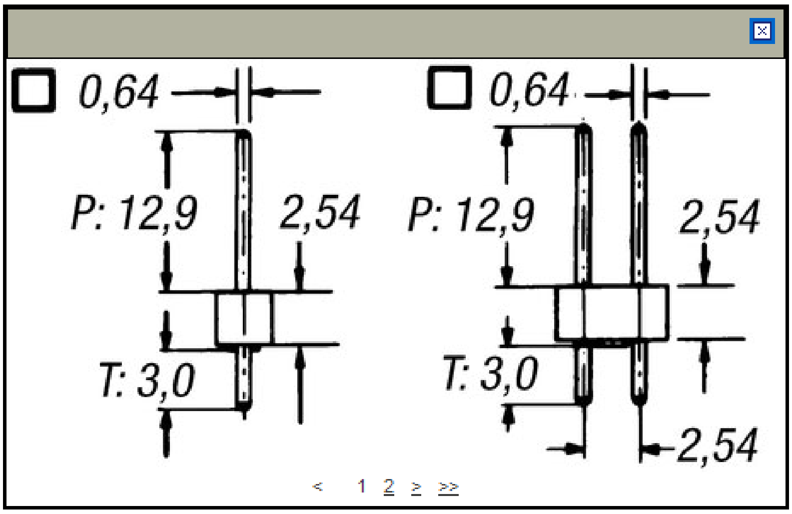

Figure 12: Electrical connector at open reservoir connector.

Example Data for DI water

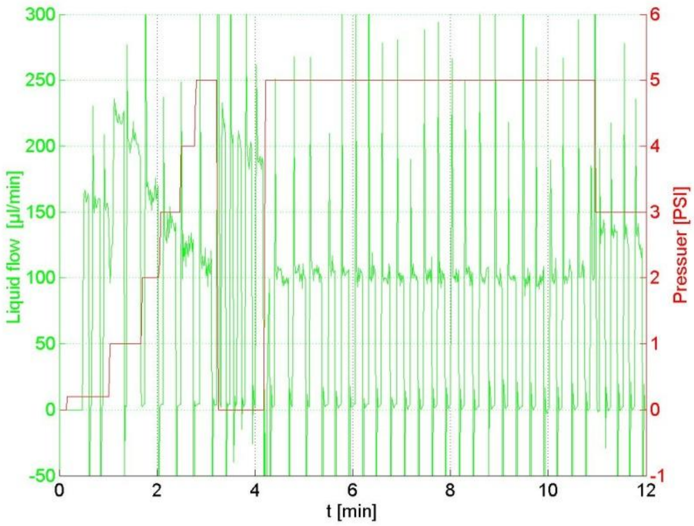

Figure 13: Flow-pressure plot at ca 8 V DC. Each spike represents a bubble passing the flow sensor