



1 *Microdosing system for tumor therapy*

2 *Si-micropump 5 mm x 5 mm, mounted on the adapter*

MICRODOSING SYSTEMS AND MICROPUMPS FOR MEDICAL TECHNOLOGY

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Applications

Microdosing technologies based on micro diaphragm pumps can be deployed for numerous applications in the field of medical technology. Applications involving implants require extremely long service life, minimum size and high energy efficiency. On the other hand, medical products to be carried on the body mostly involve disposables, which have to be producible in high volumes at low production cost.

Examples of **applications involving implants** are glaucoma therapy for reducing the intraocular pressure, drug delivery systems (e.g. for intrathecal pain therapy), as well as sphincter systems (artificial intestine or bladder sphincter).

In the future, piezoelectrically driven silicon micropumps can be deployed for systems

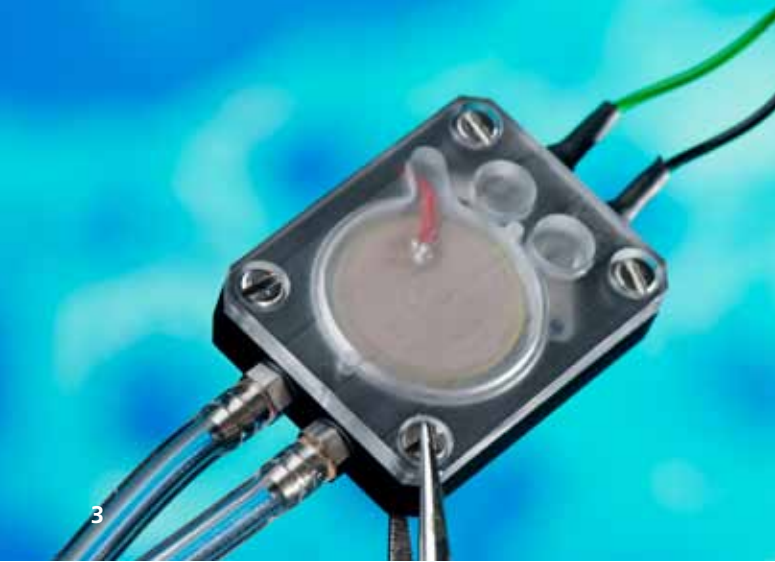
carried on the body, such as “patch pumps” for treating diabetes, as well as for pain or hormone therapy.

Metal micropumps are economically better suited for **applications involving larger dosage volumes**, e.g. for negative pressure wound therapy (NWPT), infusion systems or tumor therapy.

Further potential application areas include diagnostics, lab-on-chip systems, cell cultures and tissue engineering.

Technical innovation

The smallest silicon micropump of the world, now developed at Fraunhofer EMFT, measures mere 5 x 5 x 0,6 mm³. The small chip size brings down the production cost, thus having potential for deployment in disposable microdosing systems.



The metal micropumps made of stainless steel (Ø 20 - 30 mm x 2.1 - 2.6 mm) are better suited for higher volumes. State-of-the-art manufacturing processes, such as metal etching, laser welding or adhesive bonding, enable cost-efficient serial production even of small quantities.

All Fraunhofer EMFT micropumps fulfil the highest requirements on security and reliability, which is essential for products in the area of medical technology, e.g.:

- High back pressure resistance with liquids and gases, making purging of clogged catheters possible
- Self-blocking free flow protection for preventing false dosing in case of excess pressure on the drug reservoir
- Methods for dosage monitoring and for detecting malfunctions
- Integrated bubble monitoring and bubble separator
- The metal micropump is autoclavable several times, without negative influence on the functionality

Technical data

Fraunhofer EMFT micro diaphragm pump portfolio:

Pump type		μP015v1	μP024Av2	μP026v1	μP303	μP304
		silicon	silicon	silicon	steel	steel
Weight	g	0.07	0.06	0.03	13	5
Size	mm ³	7x7x0.8	7x7x0.7	5x5x0.6	OD=29, t=2.6	OD=20, t=2.1
Stroke volume	nL	80	140	50	25 000	6 000
Max. back pressure (air)	kPa	90	80	30	20	25
Max. suction pressure (air)	kPa	-50	-50	-20	-15	-20
Max. back pressure (liquids)	kPa	550	140	80	31	75
Max. flowrate (air)	μl/min	500	1 000	300	200 000	50 000
Max. flowrate (liquids)	μl/min	150	300	60	80 000	16 000

Interesting economical perspectives are opened up by the extreme small chip size of the silicon micropump, to be reduced further towards the target size of 3x3 mm².

For larger dosage volumes, transfer of the existing metal micropump technology into industrial production for interested companies (also SMEs) is possible already today.

Funding

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