



1 Multi layer joints of the stainless steel micropump

2 Packaged stainless steel micropump  $\mu$ P304

## STAINLESS STEEL MICROPUMPS FOR MEDICAL-, LABORATORY- AND ANALYSIS TECHNOLOGY

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### Applications

In the field of laboratory and medical technology, the dosage of minimal quantities of fluids or gases is crucial. This requires efficient and reliable, yet economic micro-dosage systems. The piezoelectrically driven stainless steel microdiaphragm pumps, developed at Fraunhofer EMFT, generate flow rates of up to 200 ml/min (air) and up to 80 ml/min (water). They are suitable for various applications, such as:

- Negative pressure wound therapy (for the treatment of chronic wounds)
- Medical implants (e.g. drug delivery, artificial sphincter implant)
- Infusion pumps
- Air sampling for gas sensors
- Autonomous cell culture devices

### Advantages

- Small size and scalable flow rates allow a wide range of applications
- Accurate dosing due to stroke volumes in microliter range
- Patent-registered piezo assembly process ensures a high back pressure capability with air as well as selfpriming and bubble tolerance with water
- Spring steel material provides excellent long-term properties
- All components in contact with the medium are biocompatible
- The pump is autoclavable, which allows hygienic re-use



### Technical innovation

The design of the pump is individually adapted to special customer requirements, which guarantees the minimum size for the application in question. For creating the pump chamber, a patent-registered piezo assembly process is used, minimizing the internal dead volume. This improves the back pressure capability for operating with gases and allows self-priming and bubble tolerance when handling incompressible media like water.

Special membrane valves with a combined hard/soft seal guarantee increased tightness against back flow.

### State of development

#### Demonstrators

Various models of robust stainless steel micropumps have already been implemented by means of laser beam welded multi-layer joints.

#### Automation

For the novel piezo assembly process, adhesive dosing equipment with pick-and-place automation was used. This makes partly automated fabrication possible.

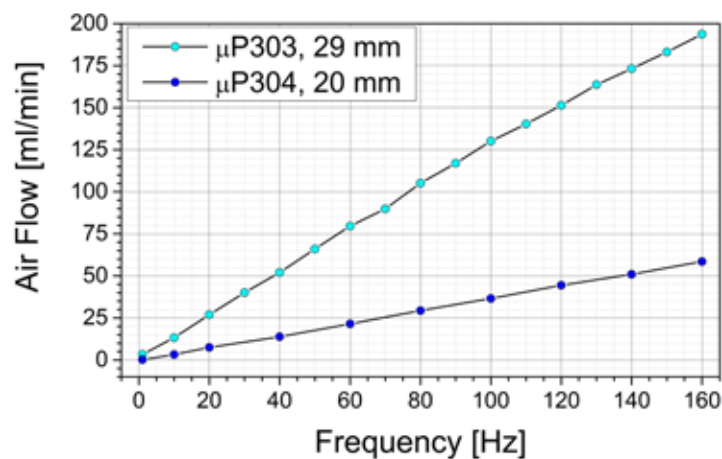
#### Fabrication

The micropumps have already been fabricated in batch sizes more than 100.

### Technical data

	$\mu$ P303	$\mu$ P304
<b>Size</b>	$\varnothing$ 29 mm x 2,6 mm	$\varnothing$ 20 mm x 2,1 mm
<b>Weight</b>	13 g	5 g
<b>Material</b>	Stainless steel Silicon	Stainless steel Silicon
<b>Max. flowrate (air)</b>	200 ml/min	50 ml/min
<b>Max. flowrate (fluid)</b>	80 ml/min	16 ml/min
<b>Back pressure capability (air)</b>	20 kPa	25 kPa
<b>Back pressure capability (fluid)</b>	31 kPa	75 kPa
<b>Energy consumption</b>	< 400 mW	< 300 mW

Flow rate characteristics of the stainless steel micropumps in respect of their size:



3 Stainless steel micropumps  
 $\mu$ P303 ( $\varnothing$  20 mm) and  $\mu$ P304 ( $\varnothing$  29 mm)  
 4 Diaphragm valve