

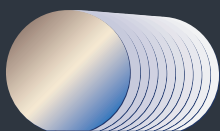
## piezoMEMS

### APPLICATIONS

Actuators  
Ultrasonic transducers  
Positioning systems  
Pressure and flow sensors  
Gas sensors  
Energy harvesters  
Accelerometers  
Micropumps

### BUSINESS AREAS

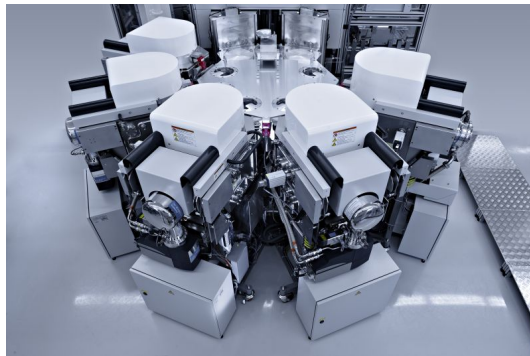
Information and communication  
Consumer electronics  
Automotive industry  
Medical  
Building and construction



piezoVolume

[www.piezovolume.com](http://www.piezovolume.com)

## FP7 piezoVolume 2010–2013



- piezoMEMS competence centre
- High volume deposition tools for high quality PZT thin films (CSD and sputtering)
- In-line testing and quality inspection equipment in piezoelectric thin film deposition
- piezoMEMS specific modelling and fabrication process emulation tools

Piezoelectric MEMS are versatile and can fulfil many of the requirements of future smart devices:

- Low power requirements
- Small volume
- High performance
- Ease of manufacture

High quality PZT thin films have been fabricated and integrated successfully with silicon microsystems in low volume. Tools for higher volumes are now requested by industry. piezoVolume has the goal of developing these tools.

In piezoVolume, three leading research groups in Europe, which are already acting worldwide in the piezoMEMS community, and highly skilled technological partners, are developing the technology needed to realize a full piezoMEMS production line.

piezoVolume has an ambitious goal of making high throughput, cost-effective and robust manufacturing of piezoelectric microsystems available to industry. The target is 2.5 Mio 1 x 1 cm devices per year from 10.000 200 mm wafers.

piezoVolume will develop the necessary tools and procedures to reach this goal by developing a platform of integrated processes for production of piezoelectric microsystems. This platform will comprise of a set of procedures, guidelines and tools covering the fabrication process all the way from the design stage to dicing of the wafers.

piezoVolume will also act as a source of piezoMEMS design and fabrication competence for interested parties.



COOPERATION

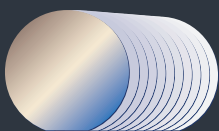
High volume piezoelectric thin film production process for microsystems

## INDUSTRY BENEFITS

- World-class piezoelectric thin films (PZT)
- Deposition processes
- PiezoMEMS modelling software
- Modelling of device ideas and design assistance
- Evaluation of alternative processing routes
- Testing services and sophisticated testing equipment
- Manufacturing of prototypes
- Small scale production using 150 mm wafers

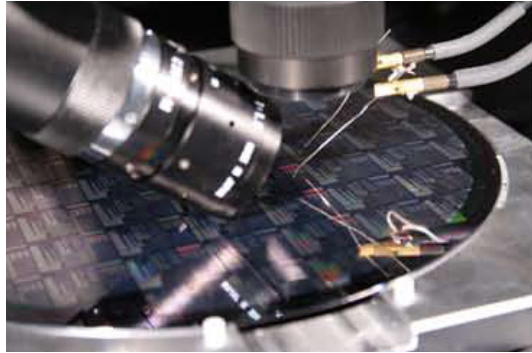
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## piezoVolume process goals

### DEPOSITION

- **Chemical solution deposition (CSD) and sputtering**
- **Throughput rate** of at least 11.000-15.000 wafers/h @ 43 % uptime (12h a day and 6d a week)
- **Deposition cost** 10-20 €/µm·wafer due to consumables and equipment depreciation @ 43 % uptime (4-8 eurocents per 1 x 1 cm die using 200 mm wafers)

### IN-LINE PIEZOELECTRIC TESTING

- **Throughput** of 10 wafers/h (37.500 wafers/year @ 43% uptime)
- **Non-destructive**
- **Modular** tool that can be installed as add-ons to existing equipment.
- **High accuracy** (10 % of real  $\epsilon_{31,d}$ )
- **A cost per wafer** of 4 €/wafer due to equipment depreciation @ 43 % uptime

### MODELLING TOOLS AND PROCESS EMULATION

- **Speed.** Simulation times should be significantly faster than conventional FEM techniques used today (i.e. in the range of minutes and hours)
- **Acceptance by industry.** The new modelling tools will be implemented into environments and design flows that are widely used by industry and compatible with already established design flows and industry standard development methodologies.

## piezoVolume—a piezoMEMS competence centre

Many SMEs and Enterprises are potential users/providers of piezoMEMS devices. The technology is quite new and there are currently no open facilities for volume production of piezoMEMS. This is holding back industrial implementation.

The competence centre seeks to act as contact point for interested parties in areas specific to piezoMEMS such as design, modelling, PZT deposition, characterization and small scale prototyping. This will lower the threshold for interested parties wishing to evaluate the feasibility of piezoMEMS technology.

## PARTNERS



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High volume piezoelectric thin film production process for microsystems