

microBUILDER

An integrated modular service for microfluidics



The Mission

The mission of microBUILDER is to increase the commercial success and competitiveness of the European industry. This is realized by facilitating the incorporation of new technologies in product key components. Hence, microBUILDER provides industry (SMEs) as well as academic research groups with a simple and cost-efficient access to mixed technology development and manufacture.

Customers of microBUILDER are offered prototyping and high-volume production of mixed technology devices mainly made of silicon, glass and plastics.

The services are focused on microfluidic devices such as:

- Lab-on-chip systems
- Valves and pumps
- Biomedical devices
- Chemical micro-reactors
- Sensors for instrumentation
- Gas and flow sensors

microBUILDER provides design and engineering services in order to support innovative developments from the first idea to the final product. Training sessions are available for customers who want to take advantage of the manufacturing services without further design support. In addition, layout and modelling software modules specifically tailored to the microBUILDER foundry services are available to assure an efficient design flow. The technological capabilities of microBUILDER are demonstrated by sample devices.

Furthermore, a User Club consisting of SMEs was founded to advise microBUILDER and ensuring that all offered services meet the demands of industry. SMEs interested to join the User Club are welcome to request a membership by sending an email to

support@microBUILDER.org.



Mixed Technology / Microfluidics

microBUILDER provides dedicated services for the development and manufacturing of prototypes and products. Primarily, mixed micro-technologies with a focus on micro-fluidic applications are offered. Among all microtechnologies, microfluidics deals with the handling of small amounts of fluids. Hence, microfluidics is an essential technology for the development of innovative products in various application fields such as:

- Diagnostics and analytics
- Drug discovery
- Drug delivery
- Medical devices
- Fuel cells
- Process and oil industry
- Machinery and automation

The development of microfluidic components and systems typically requires the combination and interaction of different technologies and competences such as:

- Moulding of plastics
- Silicon and glass micromachining
- Packaging / system integration
- Actuators
- Electronics
- Surface functionalisation / modification

All these mixed technologies and competences are available within microBUILDER. Consequently, customers have easy access to one or more of these technologies via one single interface.

The Offer

Within microBUILDER all skills and competences are available to offer industry, especially SMEs, a complete service package for the development of new products from the first idea to volume production. This includes:

- Feasibility studies
- Design and simulation services
- Product development
- Multi-project wafer services
- Prototype manufacturing
- Series production
- CoventorWare modules
- Training and education

All technologies and processes are documented in a design handbook, containing design rules for different technologies as well as specific design examples and case studies.

Members of the SME User Club are provided with first-hand access to microBUILDER information.

Additionally, members have the opportunity to influence the offered technologies and services. This guarantees that the microBUILDER services meet the demands of industry, especially SMEs.

Detailed information about the microBUILDER services can be found at:

www.microBUILDER.org



Design & Engineering Services

For the realization of new and innovative products, microBUILDER provides custom-tailored services supporting the development process from the first idea to series production.

- Feasibility and concept studies
- Proof of principle investigations
- Design, modelling and simulation
- Prototyping
- Test and characterization

All services are based on a portfolio of different validated methods, processes and technologies. The combination of these mixed technologies is described in a master design handbook which enables experienced clients to develop their own designs. Additionally, clients can make use of the microBUILDER prototyping and manufacturing services which are based on both silicon and plastics technology. microBUILDER-specific mixed technologies are implemented into software-based Process Access Kits compatible with Coventor's CAD platform CoventorWare. These kits enable users to design products based on microBUILDER's stable and characterized manufacturing processes. Consequently, clients will receive proven state-of-the-art Design-for-Manufacturability concepts.



Training

The microBUILDER consortium offers training courses for potential users in order to raise awareness for the microBUILDER services. Furthermore, training enables potential customers to create designs for the microBUILDER manufacturing processes. The training courses are developed for three different target groups:

- **Awareness level** approaches the technically interested customer, including SMEs with no previous expertise in microtechnology. Hence, the course focuses on applications of the microBUILDER technology.
- **Technology level** is dedicated to master level candidates (+last year undergraduates) who want to understand the technologies (and application areas) in detail.
- **Design level** addresses the design-experienced or inexperienced technical personnel who wants to design an own microBUILDER system with hands-on assistance.

The training material consists of PowerPoint slides, animations, videos, case studies, exercises, and Coventor tutorials specifically designed for the microBUILDER technology. In addition, internet-based multimedia tools for distant learning by web access are also available.



Multi Project Wafer (MPW) Services

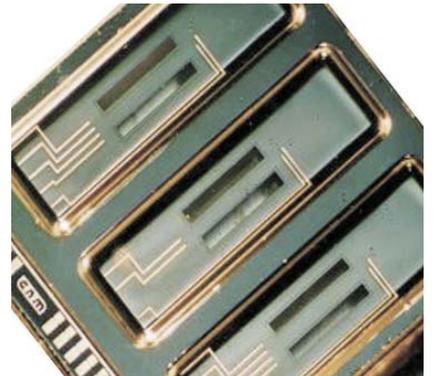
Low cost prototyping and limited volume production are possible with MPW services, in which devices of different customers are fabricated in a single wafer run. Since multiple customers share the same mask set, the costs of mask making and fabrication are divided.

MPW processing:

The microBUILDER project provides access to state-of-the-art MEMS technologies at Infineon Technologies SensoNor and TRONICS Micro-systems. The MPW processes are fully documented in the microBUILDER design handbook. Customers have the choice to either use the microBUILDER services for designing a device or to design their own component. Therefore, special training courses are provided.

Features of the MPW processes:

The SensoNor MPW process offers buried conductors and piezoresistors, thin silicon diaphragms, cantilevers and channels as well as glass and silicon cavities in a triple-stack anodic bonded configuration. The TRONICS MPW process provides silicon channels, mixing pillars, heating electrodes and impedance sensing electrodes. Further information, e.g. on the MPW schedule or technical information on the MPW offers can be found at www.microBUILDER.org



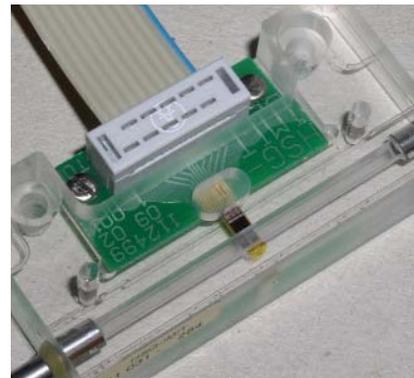
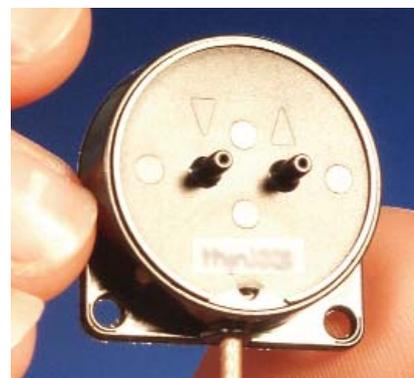
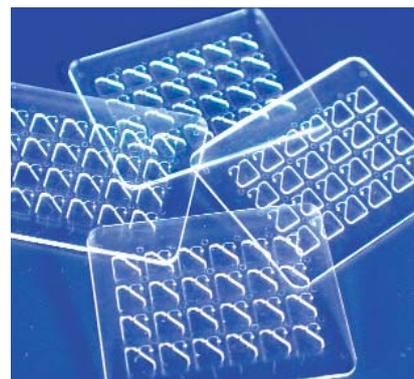
Microfluidic Construction Kit

The microfluidic construction kit offers the opportunity to develop integrated microfluidic chips, so called lab-on-chips, in an easier, faster, and less costly fashion than before: Various standard functions, such as mixing, splitting or pumping are provided on single microfluidic slides. All slides can be combined in different configurations to represent various fluidic designs. The fluid interfaces can be easily connected and disconnected, possess low dead volumes and are leakage tight. The complete assembly of the microfluidic system can be done without specific tools or know-how.

Once the design of a fluid network has been optimized on the modular system level, it can be transferred into an integrated, compact and cost-efficient device. Since mass production processes are used to manufacture the plastic slides an easy transfer from the modular to the integrated system is achieved. Within microBUILDER other materials, e.g. silicon sensors, can be easily integrated in the plastic modules to provide an even broader range of standard functionalities. This allows shorter development times and reduced costs.

Add-on-Processes

The three industrial manufacturers in microBUILDER, Infineon Technologies SensoNor, TRONICS Microsystems and thinXXS offer low-cost manufacturing of silicon/glass and plastics components. In order to increase the functionality of the devices and to enable the integration into mixed technology systems, add-on processes are also available from the microBUILDER partners. Packaging processes, patterned gold-layers, electrodes, hydrophobic patterned surfaces, surface activation for protein attachment and piezoelectric films are examples of such add-on processes. The portfolio of possible applications for the microBUILDER technology is further increased as more add-on processes are developed depending on customers' requests and requirements. All available add-on processes are qualified and documented in the master design handbook. This enables clients to make use of the add-on processes and to combine them with other microBUILDER processes or own technologies. Details about the available add-on processes can be found at www.microBUILDER.org





SINTEF

SINTEF is the largest independent research institute in Scandinavia. The Department of Microsystems and Nanotechnology has performed numerous feasibility studies and designed various microdevices, including inertial sensors (accelerometers, gyroscopes), gas sensors (microacoustic, photoacoustic, microoptical), a variety of pressure sensors and microfluidic/biomedical elements (flow sensors, lab-on-chip systems, ultrasonic devices). The designed elements have been fabricated either by the SensoNor (Infineon Technologies SensoNor AS) MPW process or in-house using SINTEF's own clean room manufacturing line. SINTEF's MiNaLab was ISO 9001 certified in 2006.
www.sintef.no

HSG-IMIT

The Institut für Mikro- und Informationstechnik (HSG-IMIT) is a leading R&D provider for microsystem technology, focussing on microfluidics and sensors. It is headed by Hahn-Schickard-Gesellschaft (HSG), a non-profit organization dedicated to support industry with applied research and development. Several laboratories and a 600 sqm clean room are equipped with a state-of-the-art infrastructure to develop and manufacture microsystems, such as lab-on-chips, drug delivery systems, flow sensors and inertial measurement units. HSG-IMIT is certified according to ISO 9001:2000.
www.hsg-imit.de

Infineon Technologies SensoNor AS

Infineon Technologies SensoNor AS, located in Horten, Norway, develops and manufactures sensors and microsystems for high-volume applications. With its new tire-pressure monitoring system, based on bulk micromachining of silicon and glass, the company has become a world-market leader in the automotive sensor area. In addition, the company has developed and currently produces angular rate sensors for automotive safety applications. Since 2003, the company is a wholly-owned subsidiary of Infineon Technologies AG and currently has about 280 employees.
www.sensonor.com

thinXXS

thinXXS produces and develops microfluidic and microoptic components and systems preferably in plastics. The company offers active microfluidic devices such as micro-pumps off the shelf or customized passive microfluidic solutions such as lab-on-chip systems. thinXXS' expertise comprises the whole value chain, from design and engineering, mold and tool fabrication via micro-molding in high volume to finishing and assembly. An accumulated experience of more than 150 years in microtechnology development and production services is used at thinXXS to serve the customers' needs worldwide.
www.thinXXS.com

COVENTOR

Coventor provides a comprehensive suite of software tools for the development of micro-electromechanical systems (MEMS), microfluidics and semiconductor process applications. CoventorWare is an industry standard platform adopted by leading MEMS and microfluidics manufacturers around the globe, and by an extensive network of university partners. Coventor is a privately held company headquartered in Cary, NC and with offices in Cambridge, MA and San Mateo, CA. The European headquarters and development centre are in Paris, France. Coventor also serves the Asia Pacific region through regional distributors.

www.coventor.com

VUC

Vestfold University College (VUC) [in Norwegian: Høgskolen i Vestfold (HVE)] with its main campus in Borre in Vestfold, Norway is a modern academic and technological centre and one of the medium-sized university colleges in Norway with 2300 full-time student equivalents. VUC has 20 faculty members in the Institute for Microsystems. The college offers Bachelor and Master degrees in Microsystems Technology, as well as contract research in this field, with packaging of microsystems and biomedical microsystems as focused fields of expertise.

www.hve.no

COREP

The Consortium for research and continuing education is a non-profit consortium created in 1987 in Turin, Italy. The consortium is composed of academic, institutional and industrial partners. The aim is to effectuate collaboration among universities, services & production sector and local public institutions in the areas of technology innovation and high level advanced training.

COREP's main activities are: education at university level addressing professionals, promotion of joint activities among industry, local institutions and universities and the creation and management of scholarships to favour the transfer of competences from university into industry.

www.corep.it

BME-ETT

The Department of Electronics Technology at Budapest University of Technology and Economics was established in 1964 to teach and research different fields of materials science, physical design and technology for the benefit of the electronics industry. Currently, the department teaches technology to students of electrical engineering and technical informatics and supports PhD studies. The department lays special emphasis on interconnection and packaging technologies as well as microfluidic systems, which act as a driving force for continued progress in electronics development in the third millennium.

www.ett.bme.hu

TRONICS Microsystems

TRONICS Microsystems, based in Crolles, France, is a flexible contract manufacturer of high value-added custom MEMS components for demanding applications. The company possesses one of the strongest experience in transforming innovative MEMS concepts and requirements into manufacturable and reliable products. TRONICS provides an ISO 9001:2000 certified end-to-end service of customization and industrialization of MEMS solutions and production of packaged and tested custom components. TRONICS Microsystems is positioned to become a leading manufacturer of customer specific bioMEMS products and addresses diverse demanding applications such as laboratory automation, medical diagnostics and homeland security.

www.tronics-mst.com

microBUILDER is part of the EUROPRACTICE network and supported by the European Union within the Information Society Technology (IST) thematic priority of the 6th Framework program. The emphasis within this program is placed on a multifaceted technological portfolio and on the integration of Micro- and Nanotechnology (MNT) in different applications. Furthermore, the focus lies on the industrialisation of technologies and the support of complete supply chains.

Project coordination

SINTEF ICT
Microsystems and Nanotechnology
P.O. Box 124 Blindern
N-0314 Oslo, Norway

support@microBUILDER.org



